POSTCIBAL SYMPTOMS AFTER PARTIAL GASTRECTOMY FOR PEPTIC ULCER

BY

STEN MEURLING

ALMQVIST & WIKSELLS BOKTRYCKERI AB
UPPSALA 1953

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Introduction

At the end of the nineteenth century and the beginning of the twentieth, the prevalent method for surgical treatment of chronic peptic ulcer was gastroenterostomy. The late results were often found to be discouraging, however. The majority of surgeons therefore took up various types of partial gastrectomy instead, especially in the twenties, and many were enthusiastic over the final result. But it was eventually discovered that even partial gastrectomy sometimes failed to give a satisfactory result. Especial stress was laid on the risk of anastomotic ulcers, but also on postoperative gastritis, changes in gastric secretion and emptying, digestive disorders, and anaemia. When Konjetzny wrote in 1932 that we have the most active era in the surgical treatment of peptic ulcer behind us, he expressed an opinion shared by many surgeons at the time.

However, the development has actually been in the opposite direction. The frequency of partial gastrectomies for peptic ulcer has everywhere increased. According to Perman (1946) and Rosenqvist (1953), figures of partial gastrectomies for peptic ulcer carried out in Sweden are as follows: 1923, *250;* 1928, *564;* 1945, *1950;* and 1950, *4338.*

This increased frequency of operations is to some extent due to the fact that partial gastrectomy has been made safer for the patient. The operative mortality has decreased. Increasing the size of the resection has decreased the risk of the most serious complication—a new ulcer. Other late sequelae have been regarded as of limited practical importance.

But during recent years it has often been stated that the symptoms which gastrectomised persons may experience during or after meals are not infrequently troublesome, and, moreover, often occur.

It has been shown that symptoms after meals may be divided into two groups:

a) *Early symptoms after meals.* These occur shortly after the meal or within half an hour of its conclusion, and as a rule continue for 10—60 mins. The symptoms may be of various kinds, occurring either separately or, more usually, combined in some way. The most common are: weakness or tiredness, feeling of fullness or tightness in the abdomen, nausea or a general feeling of uneasiness. Other not quite so common symptoms are: a sense of warmth throughout the body,

sweating, pallor or flushing of the face, palpitations, dizziness, headache, vomiting, diarrhoea.

b) *Late symptoms after meals.* These appear during the second or third hour after a meal. The symptoms resemble those experienced with hypoglycaemia—weakness, sweating, feeling of hunger, and tremors.

The early symptoms are referred to by many different names, such as "symptoms of the small stomach", "dumping syndrome", "postprandial", "postcibal", or "postcoenal" symptoms. I have here adopted the term "*postcibal symptoms*" (L. *post* after+*cibum* food). The connection between meals and the early symptoms is always obvious to the patient.

It has been shown that the late symptoms are due to hypoglycaemia, and they are therefore usually called *hypoglycaemic symptoms.* Although they are related to meals, this is not always obvious to the patient.

This work will deal with the postcibal symptoms and is based primarily on a study of more than 400 patients with more or less distinct symptoms after meals.

Abbreviations:

B I = Billroth I = partial gastrectomy with gastroduodenostomy.
B II = Billroth II = partial gastrectomy with gastrojejunostomy.
r. c. = retrocolic anastomosis.
a. c. = antecolic anastomosis.
e. a. = enteroanastomosis.

A list of patients included in the present investigation is available in the University Library, Uppsala, and a copy in the Records Office, Surgical Clinic, Academic Hospital, Uppsala.

CHAPTER I

Review of the Literature

The earliest information about postcibal symptoms in patients operated on for peptic ulcer is to be found in papers dealing with the late results of gastroenterostomy. Denéchau (1907) mentioned nausea and vomiting after meals, and Hertz (1911, 1913) described some patients who complained of an unpleasant sense of fullness after every meal. Radiological examination showed an extremely rapid passage of the barium meal through the stomach, followed by distension of the proximal part of the jejunum. Hertz considered that this accounted for the distress.

Postcibal symptoms in patients who had undergone partial gastrectomy began to be more widely mentioned after the First World War, especially in the German literature; but no great importance was attached to them, as they were supposed to disappear after a few months as a rule. From that time up to the end of the thirties, postcibal symptoms usually found but passing mention in the extensive literature dealing with the late results of partial gastrectomy. But since World War II, these symptoms have attracted great interest, particularly in the American, British and Scandinavian literature. Many theories have been advanced as to the causes of the symptoms, and various modifications of operation technique proposed to prevent them. The incidence of postcibal symptoms given in the literature varies from 0 to 73 %, as may be seen from Table I, where the sum of the figures in columns 6 and 7 shows the percentages found by various authors. (The table will be discussed more fully later.) The different results may be due to the circumstance that the investigations were made on case materials differing as regards follow-up intervals, percentages of women, and operation methods. A new follow-up investigation therefore seemed desirable, one related to Swedish conditions in particular.

The different terms used to designate postcibal symptoms refer in the main to similar symptoms, though the definitions are liable to vary from author to author.

"*Symptoms of the small stomach*" was especially common in the earlier German literature. The term referred to the fact that the patient thought his stomach felt small when he ate. Haberer (1918, 1925),

Table I. *Incidence of postcibal symptoms, taken from various authors; interpreted according to the classification defined in the present investigation (pp. 27—28).*

Author	No. of patients	Not traced where stated	Op.-method	Follow-up int. Years	Percentage of diff. grades of postcibal symptoms *The classification applied is that defined on p. 27.* Approx. equivalent to grade (pc)	Approx. equivalent to grade pc	Belong to grade pc but approx. equivalent to grade pc 2	Belong to grade pc but approx. equivalent to grade pc 3	Remarks
1	2	3	4	5	6	7	8	9	10
					"Dumping syndrome"				
Custer *et al.* 1946	500		B I, II		—	5.6	5.6		Results based on case records. The symptoms usually unchanged 5–8 years after op. (questionnaires).
,, ,, ,, ...	112		,,		—	12.5	12.5		
Goefferts *et al.* 1946 . . .	505		B I, II	4–10	—	3.2	3.2		Questionnaires.
Lake 1948	615		B I, II		—	3	3		Experience from 23 years of gastric surgery.
Muir 1949	124		B II	½–6	38	45	12		Interviews, leading questions. Age and sex made no difference.
Schoemaker 1949	94	15	B I		2–4	—			"Dumping syndrome did not occur."
Moore *et al.* 1950	155	8	B II	2–7	about 30		6.5	1.6	Questionnaires and interviews. 30% if the patients were "closely questioned".
O'Neill 1950	148	0	B I, II	1–5	—	20.9	6.8		Mostly interviews. B I somewhat better.
Wells and Welbourn 1951	some 300		B II		—	35	—	2–3	Interviews. Symptoms uncommon after B I. Often pass off in few years.
Goligher and Riley 1952	45		B I	½	20	53	11		Interviews, leading questions. 1½ years after op.: 47.5 % with symptoms (7.1 % of about grade pc 2–3). B II, various types of anastomosis made no difference.
,, ,, ,, ,,	165		B II	½	30	43	11		

Pulvertaft 1952	632		B II	$1\frac{1}{2}$	32.7	13.5		Interviews. Women more often had symptoms than men.
Bjerre *et al.* 1953	81	4	B II	$>1\frac{1}{2}$	47			Interviews.
Wallensten and Göthman 1953	295	26	B I	1–19	— 10.3			Chiefly questionnaires.
"Food intolerance"								
Hoffman 1939	364	2	B II	5–10	62			Interviews. Intolerance for sweets, milk and legumes. Most had but slight distress.
v. Goidsenhoven *et al.* 1946	94		B I, II	5	52			Interviews. Milk intolerance. 9 % "small stomach", 16 % "early distress after meal", 14 % did not tolerate sweets.
Brun and Landelius 1947	429	97	B II	5	44			Chiefly interviews. Milk intolerance. Women more often had symptoms than men. In addition, unspecified number with fatigue after meals.
" " " "	83		B II	10	41			
Gaviser 1948	364	15	B II	2–7	39			Interviews. 26 % did not take milk, 17 % did not tolerate sweets. In addition, 2.6 % with "dumping syndrome".
Bernay et Blanchet 1950	265		B II		56			Interviews. Milk intolerance. Sometimes discrete symptoms, sometimes „dumping syndrome".
Pfisterer 1951	122		B II		— 42			Interviews. Milk intolerance. Classed intolerance of milk (and sweets) as "dumping syndrome".
"Early postgastrectomy syndrome"								
Capper and Butler 1951 .	102		B I	2–11	— 0			Interviews. Various types of B II, type of ulcer, age and sex made no difference.
" " " " .	558		B II	2–11	— 14.2	8.7	5.5	
"Postprandial", "postcoenal" or "postcibal" symptoms								
Bruusgaard 1946	364		B I, II	2–10	— 15.6	14.2	1.4	Interviews. Sex made no difference.
Watson 1947	132		B II	$>\frac{1}{2}$	61			Interviews, leading questions.

Author	No. of patients	Not traced where stated	Op.-method	Follow-up int. Years	Percentage of diff. grades of postcibal symptoms *The classification applied is that defined on p. 27.*				Remarks
					Approx. equivalent to grade		Belong to grade pc but approx. equivalent to grade		
					(pc)	pc	pc 2	pc 3	
1	2	3	4	5	6	7	8	9	10
Mimpriss and Birt 1948 . .	216	15	B I, II	1–6	—	23	—	1	Interviews. B I somewhat better than various types of B II gastrectomies. 1 % had the "ill-defined" symptoms of "dumping stomach".
Ramberg 1948	203		B I, II	3–10	—	11	—	11	Interviews. Most distress the first yrs.
Drablös *et al.* 1951 . . .	313	135	B II	3–7.3	—	4.5	4.5		Interviews.
Rauch 1952	702	76	B II	1–10	45		16	2	Interviews. 11 years after op.: 39 % with symptoms but all of them slight. 52 % did not tolerate either milk, ice-cream or rich desserts. Food intolerance usually permanent.
One or more different designations									
Friedemann 1927	221	56	B I	3–6½	60				Interviews, leading questions. In the main, same patients in both investigations. The figures include patients who did not tolerate all kinds of food, had to eat small meals, suffered from "symptoms of small stomach", and whose condition had not been improved by op., but not anastomotic ulcer cases.
,, ,, ...	153		B II	3–6½	64				
Friedemann 1935	207		B I	10–17	65				
,, ,, ...	153		B II	10–17	62				
Allen and Welch 1946 . .	129	17	B II	1–14	—	31	—	2.3	Interviews. "Symptoms of small stomach", "dumping stomach", and "special food intolerance" included.
Spak 1948	185	1	B II	1–10	45				Interviews. Included are cases with one or more "dyspeptic symptoms", chiefly lassitude after meals and

Zweig (1925), and others, included among the symptoms of the small stomach a feeling of tightness, nausea, vomiting, sweating, feeling of warmth, palpitations and faintness after meals, i.e. most of the postcibal symptoms occurring after partial gastrectomy. Some writers included only a very marked feeling of fullness among the symptoms of the small stomach (Allen and Welch (1946), van Goidsenhoven *et al.* (1946), Deloyers (1946)), with the possible addition of pain on the left of the abdomen and vomiting (Boller (1947)).

"*Dumping syndrome*" is the most usual term in the more recent literature, both in English and, by adoption, in other languages. "Dumping stomach" was used for the first time by Mix in 1922, to describe a case similar to those of Hertz. Since Eusterman and Balfour stated in their book "The Stomach and Duodenum" (1936), that the dumping stomach also occurs in gastrectomised persons, the term "dumping" has become increasingly widespread in the literature. Custer *et al.* (1946) formulated a more distinct definition for "dumping syndrome". "The four cardinal and almost invariable symptoms are: (1) profound nausea and weakness; (2) a generalised and unpleasant sense of warmth throughout the body; (3) a cold diaphoresis of the face, particularly of the forehead; and (4) cardiac palpitation. In severe cases there may be hypermotility of the small bowel with excessive borborygmus ending in explosive diarrhoea." The symptoms usually began during or within 10 mins. after a meal, and lasted from 10 to 60 mins. These authors stressed that "the distress is entirely painless". Their definition has been accepted by most later authors, although some (Zollinger and Hoerr (1947), Moore *et al.* (1950), and others) included pains in the dumping syndrome.

A few writers have assigned the dumping syndrome considerably wider limits. Muir (1949) considered that all distress appearing up to 30 mins. after meals should be included. Goligher and Riley (1952) found it impossible to draw any definite limits for what should be designated "dumping syndrome". They considered that all patients who could not eat meals of normal size without inconvenience had the dumping syndrome. There were even a few writers who included both postcibal and hypoglycaemic symptoms under "dumping syndrome" (Gilbert and Dunlop (1947), Healy *et al.* (1951)).

"*Jejunal syndrome*" was suggested by Porges (1947) as a better term than dumping syndrome. For severe symptoms—fall in blood-pressure, dizziness and fainting—Porges (1938, 1947) and Boller (1947) used the term jejunal shock.

"*Afferent loop syndrome*" was the name given to postcibal symptoms with bile vomiting, and a feeling of tension and pains in the right upper

abdomen (Roux *et al.* (1950), Bjørneboe *et al.* (1951), Wells and MacPhee (1952)).

"*Food intolerance.*" Many writers have observed the occurrence of food intolerance in gastrectomised patients, particularly for milk and milk foods or sweet foods. The symptoms were chiefly postcibal and included a feeling of fullness, nausea and vomiting (Brun and Landelius (1947), Watson (1947), Gaviser (1948), and others), and sometimes fatigue, dizziness, sweating as well (Hoffman (1939), van Goidsenhoven *et. al.* (1946), Bernay and Blanchet (1950), Pfisterer (1951), and others).

"*Early postgastrectomy*", "*postprandial*", "*postcibal*" *and* "*postcoenal*" *symptoms or syndrome.* "Postgastrectomy syndrome" has been used to embrace all symptoms suffered by gastrectomised persons, excluding those from anastomotic ulcer. Butler and Capper (1951) used "early postgastrectomy syndrome" to describe postcibal symptoms only.

"Postprandial" (Adlersberg and Hammerschlag (1947), Schechter and Necheles (1949)) and "postcoenal" (Bruusgaard (1946), Ramberg (1948)) are synonyms for the designation "postcibal" (Ingelfinger (1944), Watson (1947)) that I have adopted. The definitions given for these terms were in the main equivalent to that given by Custer *et al.* for the dumping syndrome.

Views on the Origin of Postcibal Symptoms

Explanations of the postcibal symptoms have been based on changes in the functions of the digestive tract due to partial gastrectomy.

These changes are considerable. The capacity of the stomach is greatly decreased by the removal of about 2/3 of it, and the gastric remnant empties much quicker than the normal stomach. The gastric stage of digestion becomes deficient, in part due to the achylia common after gastrectomy. The achylia also allows an abnormal bacterial flora to establish itself in the upper small intestine and stomach.

The small intestine is normally protected from physically or chemically unsuitable food by the gastric digestive activity. The chyme leaving the normal stomach is adapted to the small intestine, but this is often not the case with the mixture leaving the gastric remnant. The mechanical division may be imperfect, proteins and carbohydrates may be broken down incompletely or not at all, and the same may apply to substances which are toxic or harmful in some other way. Osmotic pressure, temperature, and bacterial content may differ a great deal from the normal, and the rate at which food enters the intestine may be considerably higher than it ordinarily is.

It is usually supposed that the cause of the postcibal symptoms is to be found in the *small intestine.* Food chemically or physically unsuitable for the small intestine may have a deleterious effect. There may be

pathological absorption of substances which enter directly into the intestine or which are formed by deficient digestive processes or abnormal bacterial activity, there may be inflammatory conditions, difficulty in emptying the intestinal loops. All these factors might be expected to contribute to the symptoms associated with the eating of a meal. Some writers consider that alterations in the *gastric remnant* are most significant with regard to the postcibal symptoms. Anaemia and mental and other factors have also been supposed to facilitate the occurrence of postcibal symptoms.

The various possible causes of the postcibal symptoms that have been discussed in the literature may be classified as follows:

A. The symptoms arise mainly from the small intestine;
   1. The dumping stomach.
   2. Jejunal distension.
   3. Irritation of the small intestine and increased motor activity.
   4. Splanchnic hyperaemia.
   5. Jejunitis.
   6. Allergy.
   7. Afferent loop reflux.
   8. Afferent loop stasis.

B. The symptoms arise mainly from the gastric remnant;
   9. Gastric distension.
   10. Gastritis.
   11. Achylia.
   12. Stretching of the gastric remnant.

C. Other causes;
   13. Hypoglycaemia.
   14. Hyperglycaemia.
   15. Anaemia.
   16. Neural and psychic factors.
   17. Miscellaneous.

1. *Dumping stomach*—rapid emptying of the gastric remnant—is often regarded as the main cause of the postcibal symptoms. The more rapidly the stomach empties into the small intestine, the more the latter is subject to the stress mentioned previously. Some writers, however, have doubted whether the rapid emptying of the stomach is of any great significance, as radiological examination shows that it is common even in gastrectomised patients without distress (Perman (1935), Sénèque and Marx (1936), Hoffman (1939), Rieder (1939), Ingelfinger (1944), Bruusgaard (1946), Boller (1947), Lake (1948), Schechter and Necheles (1949), and others). Some authors who believed rapid emptying to be the cause of postcibal symptoms found it puzzling that many persons had rapid emptying but no symptoms (Custer *et al.* (1946), Machella (1949, 1950), and others).

A restricted stoma is usually supposed to retard the emptying of the gastric remnant. However, according to some authors—e.g. Ravdin *et al.* (1936), Vitkin (1940), Bruusgaard (1946), Kennedy *et al.*

(1947), Hosford (1949), Goligher and Riley (1952)—it is not so much the size of the stoma as the activity of the anastomosed jejunal loop that regulates the emptying of the gastric remnant, and also gives rise to the rhythmic evacuation often seen in screening. It is usually claimed that the emptying is slower after B I ops. than after B II ops. But Goligher and Riley (1952) did not find such a difference and pointed out (as did Perman (1947)) that in high B I resections rapid emptying was common.

2. *Jejunal distension* is regarded as one of the most important consequences of the dumping stomach. Radiological examination of such cases often shows a distension of the small intestine, and balloon distension of the human small intestine was found to give rise to symptoms resembling the postcibal (Ivy (1927), Alvarez (1948), Wright (1948)). Similar investigations with partially gastrectomised patients have been carried out by e.g. Machella (1949), Butler and Capper (1951), Goligher and Riley (1952), Glazebrook and Welbourn (1952). Their results differ, but they do not state the balloon pressures used. Butler and Capper found that distension of the upper jejunum caused a vague sensation of fullness, but seldom other symptoms. They concluded that the sensation of fullness after eating was due to jejunal distension, whereas other symptoms had some other origin (cf. p. 17). Machella (1949) and Glazebrook and Welbourn (1952) found that distension sufficient to produce symptoms resembling the postcibal always gave rise to severe pain. Ray and Neill (1947) made the same finding in non-operated persons. Distension with low pressure produced pain. A pressure of 30 mm mercury gave rise to severe pain, and the patients often became pallid, developed a cold clammy feeling and a desire to eructate. Machella, however, regarded the pain as only differing in degree from the fullness or tightness felt by some patients after meals, and stated jejunal distension to be the cause of postcibal symptoms.

It is well known that severe acute pain of any kind often gives rise to pallor, sweating, nausea and so on. Usually pain is not a prominent feature of the postcibal symptoms, and it therefore does not seem justifiable to ascribe all postcibal symptoms to jejunal distension, even if this may sometimes be the cause.

The common opinion, however, is that the sudden over-distension of the upper part of the jejunum brings on the symptoms (Hertz (1913), Ogilvie (1935, 1952), Berkman and Heck (1945), Kennedy *et al.* (1947), Porter and Claman (1949), Goligher and Riley (1952), and many others). This has been supposed to happen via a widespread enteric reflex (Custer *et al.* (1946)), or because of mesenteric irritation (Adlersberg and Hammerschlag (1949)), or because of reflex irritation of the splanchnic nerves (Dumont-Ruyters (1947), Irvine

(1948), and others). Dumont-Ruyters supported this explanation with the observation that the symptom could be prevented by local anaesthesia of the left splanchnic region.

Machella explained the distension of the jejunum in another way. He produced postcibal symptoms after intrajejunal instillation of different hypertonic solutions and found these to increase rapidly in volume. He was of the opinion that hypertonic solutions of foodstuffs (particularly sugars, but proteins and electrolytes as well) increased in volume because of osmosis, and thus distended the intestine.

3. *Irritation of the jejunum and increased motor activity.* Food eaten too hot or too cold may produce postcibal symptoms (Hoffman (1939), Muir (1949)), as may ingestion or intrajejunal administration of hypertonic solutions, particularly sugar, or chemically irritating solutions (Ivy (1927), Glaessner (1940, 1945), Schechter and Necheles (1949), Glazebrook and Welbourn (1952), and others), and this indicates that irritation may be an important factor. The same applies to a feeding jejunostomy (for. ref. see Rosenak and Hollander (1944)). Glazebrook and Welbourn showed that hypertonic solutions stimulated active contraction and peristalsis in the jejunum while symptoms were present, and they thought (like Culver (1949) and others) that the *increased motor activity* provided an adequate explanation of postcibal symptoms.

4. *Splanchnic hyperaemia.* Hoffman (1939), Perman (1945, 1947), Bruusgaard (1946), Boller (1947), Boman (1952), and others, considered that the rapid emptying induced a marked splanchnic hyperaemia, accompanied by cerebral anaemia. This hyperaemia was regarded as an intensification of the normally increased blood-flow to the viscera following a meal. Perman (1947) regarded the postcibal symptoms as characteristic of circulatory insufficiency. When reproducing the symptoms by means of a heavy meal he also found a decrease in the blood pressure. But Custer *et al.* (1946), Machella (1949), Capper (1950), and others, observed an increase when the symptoms commenced.

5. *Jejunitis* was regarded by Porges (1928, 1931, 1938, 1947) as the cause of those postcibal symptoms he described as the jejunal syndrome (p. 11). He found that patients with this trouble had numerous soap crystals and sometimes fatty acids in their faeces, and radiological examination showed that the food passed rapidly through the small intestine. These symptoms are considered typical of chronic enteritis (for references see Moltke (1950)). Porges thought that the intestinal catarrh was due to damage to the small intestine by ingested food, but admitted that he had no anatomic confirmation. Schechter

and Necheles (1949) described a gastrectomised patient with postcibal symptoms and an amoebic infection of the jejunum. The postcibal symptoms disappeared after treatment with emetine.

Perman (1947) obtained histological material from reoperations on patients with postcibal symptoms, but this material did not reveal any evidence of enteritis.

6. *Allergy.* As food intolerance was quite often found in partially gastrectomised patients (p. 12), Boller (1947), Adlersberg and Hammerschlag (1949), Muir (1949), Bernay and Blanchet (1950), and others, thought that the postcibal symptoms in some cases were possibly due to allergic reactions. Only Pfisterer (1951) investigated the matter more closely. He performed skin tests with milk extract before and after partial gastrectomy. He found no increase in the number of positive reactions, and therefore concluded that milk allergy could be disregarded as a possible source of postcibal symptoms.

7. *Afferent loop reflux* is fairly often found on radiological examination of patients who have undergone Billroth II. It is now more or less accepted that this reflux is of no clinical significance (Sénèque and Marx (1936), Vitkin (1940), Hosford (1949), Capper and Butler (1951), Forcheri (1951), Goligher and Riley (1952), and others). There are, however, some authors,—e.g. Wright (1928), Finsterer and Cunha (1931), Lake (1948), Ogilvie (1952)—who considered that some postcibal symptoms did depend on such a reflux, and a few even recommended operative methods designed to avoid the reflux.

Reflux is most common in cases where the afferent loop is sewed to the greater curvature, or where the whole gastric section is sewed to the intestine. The recommended modifications are the sewing of the afferent loop to the lesser curvature, or making the new stoma small. But Pannett (1950) sewed the afferent loop to the greater curvature for the very reason that it did allow food to mix with bile and pancreatic juices. He stated that these patients very seldom suffered from postcibal symptoms.

8. *Afferent loop stasis.* It is well known that in some rare cases inflammation or wrinkling may cause difficulties in emptying of the afferent loop. Muir (1949) considered that this might be so in some cases of severe postcibal symptoms, since secondary enteroanastomosis effected a cure. Roux *et al.* (1950) and Wells and MacPhee (1952), on the other hand, considered that superfluous duodenal juices in the afferent loop were the most important cause of postcibal symptoms (afferent loop syndrome). The afferent loop was not filled by the barium meal in radiological examination in these cases. Roux *et al.* found that a right splanchnic block prevented the symptoms, and considered that the stasis was due to hypotonia in the afferent loop

arising from the severence of the vagus branches to this part of the intestine. Wells and MacPhee (1952) thought that the stasis was due to a slight kink of the intestine.

9. *Gastric distension* was supposed to be a cause of postcibal symptoms—especially after B I ops.—by Kelling (1925), Wallensten and Göthman (1953) and others. However, radiological examination very seldom indicates gastric distension. Isolated cases of this kind have been described by e.g. Mimpriss and Birt (1948) and Wells and Welbourn (1951). The symptoms occurring after meals were fullness and nausea, relieved by vomiting.

10. *Postoperative gastritis* is in the main a gastroscopic diagnosis. Konjetzny (1932), Henning (1933), Kalk (1936), Schindler (1947), and others, found that many gastrectomised persons had gastritis, and they considered gastritis to be one of the most usual causes of distress for such patients. The predominant symptoms of gastritis are pains, nausea, and vomiting—especially vomiting of bile after meals or even on other occasions (Henning (1933), Hoffman (1939)). Such postcibal symptoms as weakness, dizziness, vasomotor symptoms, are usually not attributed to gastritis. Hertel (1928) emphasised that gastritis and the symptoms of the small stomach were two different conditions.

Gastritic changes were quite frequently observed in cases without clinical symptoms (Berg (1932), Bockus (1944), Bruusgaard (1946)). Bruusgaard, however, found gastritic changes to be more common among patients with subjective symptoms of gastritis than among patients without.

Perman (1947) found no histological indications of gastritis in re-operation material.

11. *Anacidity* or hypoacidity have been thought to be of significance in causing postcibal symptoms. Shay and Gershon-Cohen (1935), Chlapobierski and Néporent (1939), Vitkin (1940) found by radiological examination that the resected stomach emptied more slowly when hydrochloric acid was added to the barium meal. Pfisterer (1951) found by test meals (method not mentioned) that 22 % of gastrectomised patients with milk intolerance had free acid, as against 55 % of those who tolerated milk.

12. *Stretching of the unsupported gastric remnant* after B II ops. was regarded by Capper and Butler (1951) (see also Capper (1950) and Butler and Capper (1951)) as the cause of vasomotor symptoms after meals (cf. p. 14). They attributed the stretching to the weight of the meal and of the contents of the afferent loop. They found post-

cibal symptoms in 14 % of patients with B II ops. but never in cases with B I ops. They supported their opinion with several clinical experiments, which seem difficult to assess, however, and do not seem to provide definite evidence for their theory.

They believed the distension of the afferent loop to be due to a kink at the upper point of anastomosis, but a radiograph intended to show the kink is not convincing. They demonstrated radiologically that on changing from a lying position to a standing, the stoma sank lower in patients with symptoms than in patients without them. They said this finding was very difficult to evaluate, and the radiographs published are in fact difficult to interpret. Mercury-loaded balloons in the gastric remnant produced sweating, nausea and pallor in the standing position, but it seems unjustifiable to compare these experiments with normal conditions.

They thought the symptoms were mediated by the splanchnic nerves because a splanchnic block often prevented postcibal symptoms (as well as symptoms provoked by the mercury test).

13. *Hypoglycaemia* was previously regarded by some authors as a cause of postcibal symptoms, but results obtained by Evensen (1942), Bruusgaard (1946), Schechter and Necheles (1949) definitely established that postcibal symptoms were not associated with a fall in the blood sugar.

The oral glucose tolerance test shows a pathologic blood-sugar curve in many gastrectomised subjects (1/3 of all cases, according to Butler (1951)). The curve rises sharply to high values and then falls again, so that after 1—2 hours it frequently reaches hypoglycaemic values, sometimes with subjective symptoms.

Beckerman (1933) found that some gastrectomised persons experienced symptoms of a hypoglycaemic type after meals rich in carbohydrates. Some subsequent authors assumed that most symptoms following ordinary meals—weakness, dizziness, sweating, and so on—were of a hypoglycaemic kind (Christlieb (1938), Straaten and Hünermann (1939)), Gilbert and Dunlop (1947). But the time elapsing between the meal and the symptoms was not always taken into consideration, which has caused some misunderstanding. Hoffman (1939, 1952) categorically denied that hypoglycaemia was the cause of any postoperative symptoms, but he seems to have paid attention only to the early symptoms following meals. Evensen (1942) pointed out, however, that although early and late distress after meals may be similar, the time between the meal and the appearance of the symptoms is decisive for the diagnosis.

The cause of the initial hyperglycaemia appears to be that a large absorption surface rapidly comes into contact with the food, as a result of the speedy emptying of the stomach. The hypoglycaemia has been supposed to be due to exaggerated insulin response (Evensen (1942)), or to a temporary inhibition of glycogenolysis in the liver in response to high degrees of portal hyperglycaemia (Butler (1951)).

14. *Hyperglycaemia* was suggested by Glaessner (1940, 1945) to be the cause of postcibal symptoms of a shock character ("hyperglycaemic shock"). He stated that these symptoms were always accompanied by hyperglycaemia. No evidence for this theory was put forward.

Schwartz *et al.* (1942), Machella (1949), Schechter and Necheles (1949), could not confirm Glaessner's findings. Glucose administered intravenously in subjects who experienced postcibal symptoms after oral glucose did not give rise to similar symptoms (Adlersberg and Hammerschlag (1947), Machella (1949), Schechter and Necheles (1949), Kirkeby (1951)).

15. *Anaemia.* Hypochromic anaemia sometimes develops after gastric resection (for references see Lyngar (1950)). Lyngar observed that patients with anaemia and dyspepsia usually said that the dyspepsia was improved after the anaemia was cured. He thought this had some connection with an injury to the epithelium due to iron deficiency, and that the epithelium became stronger when the iron deficiency was overcome.

Bruusgaard (1946) found that of 18 women with haemoglobin values below 60 %, half suffered from postcibal complaints (as against 15 % of all women in his material). Jasiński and Ott (1951) considered that a hidden iron deficiency in the tissues (revealed by iron-absorption tests) was the cause of the "so-called dumping syndrome". But in this latter they included not only postcibal symptoms but also hypoglycaemic symptoms, general tiredness, loss of appetite, nervousness, etc.

16. *Neural and psychic factors.* Postcibal symptoms in many respects resemble symptoms from sympathetic stimulation. This led many of the above-mentioned authors to suggest that various factors, such as jejunal distension, irritation and increased motor activity of the small intestine, stretching of the gastric remnant, produced postcibal symptoms by reflex stimulation of the sympathetic nervous system. Support for this idea has been found in the fact that splanchnic block—left-sided (Goefferts *et al.* (1946), Dumont-Ruyters (1947)), right-sided (Roux *et al.* (1950)), or bilateral (Butler and Capper (1951), and others)—often prevented postcibal symptoms. The quantities of anaesthetic injected were relatively large and the results might have been partly due to effects after absorption.

On the other hand, Perman (1947) remarked that patients who had undergone bilateral sympatectomy sometimes had postcibal symptoms during a period immediately after this operation. Lake (1948), Culver (1949) and others considered that vagal imbalance was involved in the production of postcibal symptoms. Culver reported a case where splanchnic block intensified postcibal symptoms. Stapler (1949) and others stated that vagotomy abolished postcibal symptoms in some cases, but was ineffectual in others. The part played by the autonomic nervous system seems to be obscure.

Adlersberg and Hammerschlag (1949), Eitinger (1949), Muir (1949) and Pulvertaft (1952) were of the opinion that psychosomatic factors were sometimes prevalent, and that psychotherapy might be of some value. Psychosomatic factors probably explain much that has

been ascribed to "imbalance of the autonomic nervous system" (Perman (1947)).

17. *Miscellaneous.* Smith (1951) stated that the serum potassium decreased during and after the presence of postcibal symptoms. Munck (1952) was unable to verify this finding. He thought a humoral factor was released in the wall of the jejunum.

Pontes and Neves (1953) found decrease of the eosinophilic cells in blood during the first hours after a meal producing postcibal symptoms, and regarded this as a sign of adrenal stimulation. Other authors have speculated about the absorption of products arising from abnormal bacterial activity on carbo-hydrates in the jejunum (Pfisterer (1951)), and disturbances of the acid-base equilibrium (Grunert (1953)).

To summarise, it may be concluded that there are several different and often conflicting opinions about the causes of postcibal symptoms. There is usually little effective evidence for the different points of view, and these are often theoretical speculations on the basis of radiological and other findings in patients with postcibal symptoms.

It is probable that some of the causes advanced do give rise to postcibal symptoms in some cases, but there is no irrefutable proof that any one of the causal connections referred to is of decisive importance for postcibal symptoms. Rather, does it seem very probable that many different factors are involved in the production of postcibal symptoms.

CHAPTER 2

Method of Approach

Outline of the Present Investigation

The present follow-up investigation of partially gastrectomised patients was originally undertaken to obtain fresh data about the incidence of postcibal symptoms (cf. p. 7), and was later extended to include some groups of non-gastrectomised persons.

It was noticed early on that some patients with allergy had unusually severe symptoms. This suggested the possibility of a connection between allergy and postcibal symptoms in some cases or on certain occasions, so this point was also taken up.

The majority of the patients were interviewed personally, most of them at the hospital, though I had to visit some of them in their homes. In other cases patients were contacted by letter.

Tests were carried out on some patients—intracutaneous antigen tests, provocation meals, radiological examinations, and therapeutic tests. A non-gastrectomised woman with ileal fistulas was also examined.

The work commenced at Karlskoga Hospital in 1947, and continued in Uppsala from 1949 onwards. Certain results have already been reported (Meurling (1948, 1951)).

Questions Considered

Answers were sought to the following questions:

1. How frequent and how severe are postcibal symptoms in persons partially gastrectomised for peptic ulcers and in non-gastrectomised persons?

2. Is there any evidence that allergic factors may be associated with postcibal symptoms?

Other possible mechanisms for the postcibal symptoms have been discussed in this connection, and some questions of practical clinical significance dealt with.

Material

The main series consisted of 624 patients followed-up $^1/_2$*—15 years after partial gastrectomy for peptic ulcers,* i.e. gastric, duodenal, or

Table II A. *The partially gastrectomised patients.*

	"Karlskoga" ♂	"Karlskoga" ♀	"Uppsala 46" ♂	"Uppsala 46" ♀	"B II" ♂	"B II" ♀	"B I" ♂	"B I" ♀
Number of patients operated on during the given period	142	21	181	40	162	39	65	37
Postoperative deaths	3	1	10	1	10		2	
Subsequent deaths:								
a) as a sequel to operation					2[1]		2[2]	
b) from other causes	1	1	1		12	2	4	9
Remaining for follow-up investigation	*138*	*19*	*170*	*39*	*138*	*37*	*57*[3]	*28*
Interviewed personally	*136*	*19*	*165*	*39*	*138*	*37*	*54*[3]	*28*
Contacted by letter	*2*[4]		*5*				*3*	
Period between operation and follow-up:								
½ – < 1 year	28	5	20	5				
1 ,,	27	3	46	12				
2 years	18	3	36	9				
3 ,,	20	1	41	10				
4 ,,	21	1	12	1				
5 ,,	14	5	12	2	1			
6 ,,	5		3		9	2		
7 ,,	1	1			24	12	1	
8 ,,	2				20	3	4	4
9 ,,	2				16	8	22	5
10 ,,					16	6	7	7
11 ,,					12		11	6
12 ,,					7	4	4	3
13 ,,					16		8	3
14 ,,					9	1		
15 ,,					8	1		
Median time in years	2.8	2.7	2.5	2.3	10.0	9.3	10.4	10.8
Age at operation:								
Less than 30 years	21	2	16	3	15	4	7	3
30—39 ,,	59	5	36	4	46	7	14	
40—49 ,,	35	6	54	9	33	9	28	14
50—59 ,,	16	4	42	14	33	13	5	6
60 years or more	7	2	22	9	11	4	3	5
Interviewed personally:								
Gastric ulcers	18	6	37	11			25	11
Duodenal ulcers	111	11	118	24	138	37	27[3]	17
Other ulcers[5]	7	2	10	4			2	
Billroth I	32	6					54[3]	28
Billroth II	104	13	165	39	138	37		
Type of anastomosis:								
a) retrocolic	103	13	108	26	126	36		
b) antecolic	1		53	13	11	1		
c) not stated			4		1			

Table II B. *The control groups.*

	"Karlskoga control"	"Peptic ulcer"	"Uppsala control"	"Asthma"
Interviewed or contacted by letter	87	67	177[1]	48[2]
Age when interviewed:				
Less than 30 years . . .	22	9	25	11
30—39 ,, . . .	31	25	37	7
40—49 ,, . . .	20	14	37	8
50—59 ,, . . .	8	14	37	14
60 years or more . .	6	5	41	8
No. of men	67	63	153	26
No. of women	20	4	24	22

[1] Questionnaires were sent to 195 patients. 3 of these were dead, 2 severely ill, and 4 gastrectomised. 9 patients could not be traced.

[2] Questionnaires were sent to 51 patients. 1 had been gastrectomised, and 2 could not be traced.

anastomotic ulcers. Open ulcers or scars left by them have been counted as ulcers. Patients operated on for diagnosed peptic ulcer who were found to have gastritis have been included among the peptic ulcer cases.

All patients who had undergone ordinary partial gastrectomy for peptic ulcer at Karlskoga Hospital or the Academic Hospital in Uppsala during certain periods (see below) *were traced*. Particulars about the cause of death were obtained for patients who had died after leaving hospital. Half a year was set as the lowest limit for follow-up. Generally the patients had then been at work for some months, and could reasonably be expected in the main to have adopted themselves to their new situations.

In order to be able to compare the information about postcibal symptoms obtained after different follow-up intervals, for different operative methods, etc., patients were chosen for the follow-up investigation who had been partially gastrectomised during certain periods—appropriate in these respects, but otherwise arbitrarily chosen. Four groups of patients were obtained in this way. They have been designated the "Karlskoga", "Uppsala 46", "B I", and "B II" groups. These groups differ in other respects, besides the follow-up intervals

[1] 1 died of chronic enterocolitis, present since the operation.
1 died of amyotrophic lateral sclerosis, which appeared after the operation (case 1 Ask-Upmark, (1950)).

[2] Died after reoperation for anastomotic ulcer.

[3] After reoperation, 1 patient was included in "Uppsala 46" and 1 in "B II".

[4] One B I and one B II.

[5] Anastomotic ulcers, gastric and duodenal ulcers together.

and operative methods. The age distribution, the percentage of women, the number of cases with duodenal and gastric ulcers are different in the different groups, as may be seen from Table II A.

The control series of non-gastrectomised persons consisted of 379 cases, divided up into four groups—called "Karlskoga control", "Uppsala control", "peptic ulcer", and "asthma" (Table II B).

Further particulars of the various groups of patients are given below. Precise figures are given in Tables II A and B.

Partial gastrectomies

"Karlskoga." 157 patients who underwent operations during 1942—48. Most of them were interviewed in 1948—49.

As a rule, the gastrectomies involved removal of about 2/3 of the stomach.

In about one quarter of the cases the operation was B I, the lower part of the gastric section being anastomosed with the duodenum. The other cases had a B II operation with retrocolic loop without enteroanastomosis, except for one case with antecolic loop and enteroanastomosis. The gastric section was partly closed at the lesser curvature so that the gastrojejunostomy admitted two or three fingers. Palliative resection (for technique see Spak (1948)) was carried out in 26 % of the B II cases. Three surgeons performed the operations, the Chief Surgeon doing nine tenths of them. B I and B II were used alternatively during 1942—45, but after that only B II, with one exception (a man).

"Uppsala 46." 209 patients who underwent Billroth II operations during the period 1/1/1946—30/5/1949. Most of the interviews took place during 1949—50.

About two thirds to three quarters of the stomach was removed in these cases. The anastomosis was most often retrocolic.

An enteroanastomosis was always done with the antecolic type of operation, and as a rule with the retrocolic type as well (Hultén (1943)). In antecolic gastrojejunostomy, the afferent loop was sometimes attached to the greater curvature and sometimes to the lesser. With a few exceptions, the whole of the stomach section was sewn to the intestine. Palliative resection was performed in 16 % of the cases. 13 surgeons each performed from 1 to 44 operations.

"B II." 175 patients with duodenal ulcer who underwent Billroth II operations during 1936—45. I have made use of case material which Spak investigated postoperatively in 1946, his findings being published in Acta Chirurgica Scandinavica 1948 (Vol. 97, pp. 91—112). The patients were interviewed during 1951 and 1952.

It was usual to remove less of the stomach in operations performed during 1936—1941 than was later the case (about one half for the former and two thirds for the latter). Otherwise, the methods of operation were the same as described under "Uppsala 46". Palliative resection was performed in 41 % of the cases 18 surgeons each performed between 1 and 29 operations.

The patients included cases of duodenal ulcer, duodenal + gastric ulcers, pyloric ulcer, anastomotic ulcer following B I gastrectomy, and duodenal ulcer persisting after gastrojejunostomy.

"B I." 85 patients who underwent Billroth I operation during 1939—43. The interviews took place in 1952.

About two thirds of the stomach was removed. The whole of the stomach section was attached to the duodenum in the majority of cases, the duodenum being widened where necessary by a longitudinal incision. 11 surgeons each performed between 1 and 25 operations. All of the surgeons who performed B I operations did operations in the B II group as well. Following later reoperation, one of these patients has been included in "B II" and one in "Uppsala 46". They are therefore counted only in these latter groups.

The control groups

"Karlskoga control." 87 patients who entered the hospital for other complaints than peptic ulcer (low back pain, varicose veins, injuries, etc.), and members of the hospital staff. The interviews took place during 1948 and 1949.

"Peptic ulcer." 67 patients from Karlskoga and Uppsala were interviewed before operation in the years 1947—1951.

"Uppsala control." 177 patients who had undergone operations for simple inguinal or femoral hernia during 1946—48. They were chosen at random from the patient registers. Only patients between 20 and 69 years of age at the time of the operation were included.

"Asthma." 48 patients who had been treated for asthma at the Medical Clinic, Academic Hospital, Uppsala, during 1946—1952. They were chosen at random from the patient registers. Only cases which according to the records did not have other serious complaints were included.

The "Uppsala control" and "asthma" groups filled in detailed questionnaires. Nearly all of those who reported postcibal symptoms of some kind, and in the "Uppsala control" group those who reported allergic symptoms, were either interviewed personally or by further correspondence.

Other patients not included in the above groups, both operated and unoperated cases, were also interviewed and examined. Some of the results obtained from them are used later on.

The Interviews

The partially gastrectomised patients were asked about the general state of their health and whether they had experienced any stomach

trouble after the operation. Particular attention was paid to postcibal symptoms. Where such occurred, it was endeavoured to establish the symptomatology, the development after the operation, and the effect of the size and content of meals. It soon became apparent that patients answered such questions as "Do you feel well in your stomach?", "Are you able to eat any sort of food?", with "Yes"—even when they evidently suffered from postcibal distress. I therefore decided to use several so-called leading questions in addition.

Patients were asked if they had, or had had, any of the following symptoms after meals: weakness, tiredness, drowsiness, feeling of warmth in the body, face-burning, sweating or moistness of the skin, palpitations, headache, dizziness, frequent breaking of wind, nausea, belching, vomiting, abdominal ache or pain, distension or tightness of the abdomen, pallor or flushing of the face, difficulty in breathing, running nose, body rash, itching, looseness of the bowels or diarrhoea, increased need to urinate. Some "blind" questions were also inserted: pain in the back, prickliness on the soles of the feet.

The interviews included questions about other abdominal distress or other illnesses, weakness a couple of hours after meals, changes in weight from the period before the operation to the time of the interview, and consumption of alcohol. The current weight and height were usually recorded, the abdomen examined, and the blood-pressure taken in some cases. I further asked whether the patient suffered, or had suffered, from any symptoms suspected of being of an allergic nature.

The use of leading questions always introduces the risk of suggestion. The patients were therefore cross-questioned in various ways.

For about six months prior to the interviews used in this account, I had carried out preliminary interviews and examinations of about 60 cases. The questionnaires used in interviewing patients during 1948—50 were drawn up after this preliminary work. These questionnaires were sent out to be read through by the patient. Patients interviewed during 1951—52 did not receive questionnaires, but were instead asked to give a spontaneous description of symptoms they had. They afterwards answered supplementary questions.

I have no reason to believe that the different methods affected the answers given.

10 partially gastrectomised patients not interviewed filled in detailed questionnaires and were if necessary contacted by letter afterwards. For the patients in the control groups the questions given at the interview or the questionnaires filled in were similar to those for the gastrectomised patients, with appropriate modifications.

Definition and Classification of Postcibal Symptoms

All symptoms commencing towards the end of a meal or within about half an hour after the meal have been regarded as postcibal. It is not possible to give a definite time limit for postcibal symptoms, since the same symptoms may occur after different intervals, though seldom after as much as 45—60 mins., for the same patient on different occasions.

The postcibal symptoms were divided into different grades of severity, and patients assigned to the grade most appropriate to their condition during the weeks and months immediately prior to the interview. The character and frequency of the symptoms, and the changes of diet necessary after the operation were taken into account.

As with all gradations of subjective symptoms, this division is not altogether unambiguous as the ability of patients to give a clear account of their distress varied somewhat. It was also possible for some patients to avoid postcibal distress by taking appropriate measures, whereas others were not able to do so, e.g. because of their occupation. Some patients had received advice on diet or medicine which eased the trouble considerably. In order to obviate possible ambiguity in the grading, and to give a clearer indication of the difference between the grade with practically no distress—pc 0—and the grades with definite postcibal distress—pc 1, 2, and 3—an intermediate grade was introduced — (pc).

Grade pc 0. No postcibal symptoms, insignificant symptoms such as slight tiredness or drowsiness after large meals.

Also included in this grade are patients who occasionally experienced slight nausea, regurgitation, or other slight abdominal symptoms after a large meal or some particular food, as well as those who quickly became full or had a feeling of fullness, without other symptoms.

Grade (pc). Occasional slight or latent postcibal symptoms.

This grade includes patients who occasionally became tired or faint after ordinary meals, those who more regularly experienced slight discomfort or drowsiness after eating, as well as those who vomited or had diarrhoea on single occasions after meals.

"Latent symptoms" signifies that the patient earlier had definite postcibal distress, but had overcome this more or less completely by paying attention to his diet. Some such patients had entirely given up certain common foods—milk, for instance—and had thereby rid themselves of the earlier symptoms.

Grade pc. Definite postcibal symptoms.

This grade includes people who experienced considerable tiredness, drowsiness and weakness after eating, these symptoms sometimes being accompanied by other general symptoms such as nausea, palpitations, feeling of warmth, sweating, dizzi-

ness, headache. There was usually some kind of gastrointestinal distress as well. Patients with persistent severe gastrointestinal postcibal distress without other pronounced symptoms were also included in this category.

Grade pc was divided into three groups: mild, moderate, and severe postcibal symptoms. The frequency and severity of the distress served as the basis of this division. *Patients with mild symptoms did not as a rule consider them to be important. Patients with moderate or severe symptoms were usually more or less indisposed or even invalided by them.*

Grade pc 1. Mild postcibal symptoms.

The frequency varied from daily—with faintness, slight palpitations and nausea, for instance—to a few times a month where the distress was severe. In the latter case, the patient had to rest for a short time after eating. Patients in this grade had usually to observe a certain caution regarding particular dishes and the amount of food eaten.

Grade pc 2. Moderate postcibal symptoms.

The patients had such severe distress that they were obliged to lie down after meals one or more times a week. They suffered distress each day as a rule, though when very careful about their food they might avoid it for some days at a time.

Grade pc 3. Severe postcibal symptoms.

The patients experienced distress after practically every meal. The symptoms were so severe that they had to lie down at least once a day after eating.

Several examples are quoted on the following pages to illustrate the application of grades.

K denotes the Surgical Clinic, Karlskoga Hospital.
U denotes the Surgical Clinic, Academic Hospital, Uppsala.
1234/46, for example, signifies that the patient's number in the hospital register is 1234 and the year of operation 1946.

Case 1. U 2918/40. Salesman, underwent B II (r. c.) op. for duodenal ulcer at age of 51. Interviewed 10 years later. Milk caused him to eructate somewhat, and he regurgitated some of it after 5—6 mins., though he did not feel sick. No other discomfort after meals. Weighed 15 kg more than his average preop. weight. *Grade pc 0.*

Case 2. U 2759/47. Fisherman, underwent B II (a. c. + e. a.) op. for gastric ulcer at age of 62. Interviewed 2 years later. His abdomen felt very distended a few mins. after even small quantities of meat soup, and he felt sick for 1—2 hours. Otherwise, he could eat all food without distress. Weighed 3 kg less than his average preop. weight. *Grade pc 0.*

Case 3. U 2164/46. Farm-worker, underwent B II (r. c.) op. for gastric and duodenal ulcers at age of 35. Interviewed 3 years later. At first after the op. he became tired after meals, warm, sweaty, red in the face, his abdomen felt distended, he had palpitations, and sometimes had to rest. His condition improved with

time, and the year prior to the interview he had only felt tired and his abdomen distended if he sat still after meals. He had most distress from fluid foods, milk foods, sweet soups, and he therefore seldom took them. Always small meals. Weighed 20 kg less than his average preop. weight. *Grade (pc).*

Case 4. U 911/46. Factory worker, underwent B II (r. c. + e. a.) op. for gastric ulcer at age of 44. Interviewed 6 years later. He felt well but did not tolerate milk. If he drank 1/2 cup of milk without other food, it felt as if everything in his abdomen stopped still. He had palpitations, sweated, and his body felt hot as with fever. He became weak and faint, felt sick, and had to rest a while. He tried milk many times to begin with, but always with the same result; he had therefore given up milk 1 year previously and his symptoms had since disappeared. He always ate small meals—otherwise he could easily get slight distress. Weighed 10 kg less than his average preop. weight. *Grade (pc).*

Case 5. U 2642/47. Female office-worker, underwent B II (a. c. + e. a.) op. for gastric and duodenal ulcers at age of 63. Interviewed 2 years later. After the op. she became very tired immediately after all ordinary meals, and the more she ate the more tired she became. It she had anything to do after a meal, she had to eat little and carefully. She could not drink even half a coffee-cup of milk without her abdomen feeling tight and distended, but a cup of boiled milk gave no trouble. Weighed 5 kg less than her average preop. weight. *Grade pc 1.*

Case 6. K 523/44. Ladies' hairdresser, underwent B II (r. c.) op. for duodenal ulcer at age of 23. Interviewed 7 years later. Since the operation she became somewhat listless and sleepy after meals. Now and then she also perspired, felt faint and hot, and her cheeks flushed, her heart thudded, she felt dizzy, and there was a buzzing in her ears. Her abdomen felt like a balloon, but she did not feel sick and had no pain. She often had these symptoms in the beginning, but they were so unpleasant that she always ate small meals to avoid them—she did not feel when she should stop eating before it was too late. Did not know of any particular food which brought on symptoms. Weighed 3—4 kg less than her average preop. weight. *Grade pc 1.*

Case 7. K 1796/48. Joiner, underwent B II (r. c.) op. for duodenal ulcer at age of 49. Interviewed 1 year later. A few times each week, 10—15 mins. after eating, he felt powerless and "fuddled", had palpitations, and felt difficulty in breathing. His face became flushed. His abdomen gurgled and bubbled. The distress disappeared within an hour. The first time he felt it was about 1 month after the op., when he ate an egg and became intensely ill. The distress was worst after eggs or egg dishes, less after milk, cheese, gruel and sweet dishes, or after really large meals. Weighed 10 kg less than his average preop. weight. *Grade pc 1.*

Case 8. U 2604/46. Housewife, underwent B II (r. c.) op. for duodenal ulcer at age of 56. Interviewed 3 years later. She felt tired and sick after meals. If she kept on her feet she brought up a green, bitter liquid like bile, sometimes as much as a whole plateful, and immediately felt better. She usually lay down for an hour after meals, and then did not need to vomit. Milk and eggs, fruit soups and desserts did not agree with her. Solid food was much better. Weighed somewhat more than 5 kg less than her average preop. weight. Had had asthma for several years prior to operation. *Grade pc 2.*

Case 9. K 1691/46. Farm-worker, underwent B II (r. c.) op. for duodenal and gastric ulcers at age of 53. Interviewed 2 years later. Could not eat meals more than 1/2 as large as before the op. Towards the end of a meal, or about 5 minutes afterwards, his stomach felt distended, he felt sick, hot about the body—"as if he would catch fire", he sweated, was tired and weak in his legs. About once a week the symptoms were more severe—he became dizzy, got an ache in the forehead, and felt as if he would faint. He sometimes had to lie down in the field for a time after he had eaten. Everything passed over in 15—30 mins. if he rested, but if he kept on his feet it was nearly impossible to work. Cakes, fruit soups and compotes, chocolate, raw fruit, pork sausage, fish, were some things

which particularly gave trouble. Weight the same as average preop. weight. *Grade pc 2.*

Case 10. K 1640/46. Farmer's wife, underwent B II (r. c.) op. for severe, recurrent gastric haemorrhage at age of 33. An ulcer was suspected but atrophic gastritis was found. Interviewed 2 years later. Even after the first meals in hospital after op. she felt faint and sweated. The distress became worse when she returned home, and had since persisted unchanged, though she had felt better for short periods. At first the distress began immediately after eating, but later there was a respite, and it did not begin so drastically as before. The symptoms were nausea, heaving, a feeling as if wind pressed up against the heart. Her abdomen gurgled noisily. She felt faint and feverish throughout the body, but some mins. later she was cold, shivering, and had gooseflesh. Her heartbeats were heavy and rapid, and she got a slight throbbing ache in her head, her head felt queer, and she was ready to faint. She had to lie down after almost all meals. The symptoms were especially marked after milk and sweet dishes. After about half an hour's rest wind was released both upwards and downwards, and the symptoms abated. She was tired the whole day, and unable to work properly. Weighed 5 kg less than her average preop. weight. *Grade pc 3.*

Case 11. U 3245/41. Cook, underwent B II (r. c.) op. for duodenal ulcer at age of 32. Interviewed 10 years later. The first year he was able to eat without trouble, especially dry solid food. At the time of interview he felt ill after all meals, in spite of the fact that he did not eat meals more than half as large as previously. Well-cooked vegetables, sandwiches, and coffee were best, and milk worst. The distress began while he was still eating or a couple of mins. afterwards, and consisted of weakness, complete loss of strength, palpitations, a hot feeling in the face, sweating over the whole body, slight dizziness; he became deaf, and felt completely apathetic. He felt sick, and brought up a little bile and mucus, but seldom vomited. His abdomen felt distended, but there was no pain. The symptoms passed over after 10—30 mins., but he got explosive diarrhoea about 1 hour after eating. The distress was sometimes so bad that he could neither eat nor work. Weighed 6—7 kg less than his average preop. weight. *Grade pc 3.*

Statistical Methods

Some of the calculations employ statistical methods in current use.

The standard error of a percentage has been computed by the following formula:

$$\varepsilon_p = \sqrt{\frac{p\,(100 - p)}{n}}$$

where p is the percentage, ε_p the standard error of the percentage, and n the number of cases. If the number of cases was less than 50, the $(n - 1)$ correction has been used.

The standard error of a difference, D, is computed by the usual formula:

$$\varepsilon\,(D) = \sqrt{\varepsilon\,p_1^2 + \varepsilon\,p_2^2}$$

where p_1 och p_2 are the two different percentages compared.

Differences exceeding 3 times their standard error are regarded as statistically significant, and differences 2.5—3.0 times their standard error as statistically probable.

CHAPTER 3

Incidence of Postcibal Symptoms

In this investigation, postcibal symptoms have been met with in all the four groups of partially gastrectomised patients. For the total case material, 624 patients, at the time of interview, $^1/_2$—15 years after operation,

32.7 ± 1.9 % had no postcibal symptoms *(grade pc 0)*
26.0 ± 1.8 % indicated occasional, slight or latent postcibal symptoms *(grade (pc))*
41.3 ± 2.0 % had definite postcibal symptoms *(grades pc 1—3)*, of whom (in percentages of the total number of patients)
29.2 ± 1.8 % had mild symptoms *(grade pc 1)*
9.4 ± 1.2 % had moderate symptoms *(grade pc 2)*
2.7 ± 0.6 % had severe symptoms *(grade pc 3)*.

A similar high incidence of postcibal symptoms was also reported by Muir (1949) and Goligher and Riley (1952). Both gave a total of 73 % with symptoms. The figures usually given are lower—30, 15, 10, 5 %—and follow-up investigations have even been reported where no cases of postcibal symptoms occurred. It seems improbable that such wide variation in different case materials could really occur. An examination of the literature reveals two factors which seem to be of primary importance in accounting for the different results arrived at by different authors.

1. The thoroughness with which patients were questioned, and in particular, whether leading questions were asked or not. Leading questions must be used (cf. p. 26) if a clear picture of the occurrence and severity of postcibal symptoms is to be obtained. Investigations based only on questionnaires are unsatisfactory in this respect.

2. The way in which the term corresponding to "postcibal symptoms" is defined—the narrower the definition the lower the corresponding incidence.

These factors make it impossible to draw any safe conclusions from a comparison of different authors' results.

Provided the denotation used for postcibal symptoms is properly defined, the results attained by different authors may be incorporated in a definite scheme. This has been done in Table I, which includes

some important publications. The different figures given have been interpreted in terms of the grades used in the present investigation. Some of the figures have been calculated from information in the original publications. Cases of food intolerance are included. Incidence figures where postcibal and hypoglycaemic symptoms have been combined in one group have not been included.

In the majority of follow-up investigations from the twenties and thirties, and even later, results of operations were judged as excellent or good, satisfactory, fair, poor, and so on. It was often mentioned that some of the patients in these groups had dyspeptic symptoms or faintness, sweating, etc., particularly after meals (see, e.g., Bohmansson (1926), Lublin (1931), Rieder (1934), Perman (1935), Harms (1936)). But no figures for the incidence of purely postcibal symptoms were given, though Friedemann (1927, 1935) and Hoffmann (1939) gave such detailed information that the frequency of such symptoms can be estimated.

The limits set by different authors for the different grades of severity of postcibal symptoms naturally do not coincide with those I have used, and direct comparison between the figures given in the table is therefore difficult.

The following is a general division of various results:

1) Authors who personally interviewed patients and paid attention to all degrees of symptoms (approximately grades (pc) and pc 1—3) obtained incidence figures of about 60—70 % (e.g. Friedemann (1927, 1935), Hoffmann (1939), Watson (1947), Muir (1949), Goligher and Riley (1952)).

2) Authors who did not include the mildest symptoms (i.e. included approximately grades pc 1—3) obtained incidence figures of about 30—45 % (e.g. Allen and Welch (1946), Wells and Welbourn (1951), Pfisterer (1951), Pulvertaft (1952), Rauch (1952)).

3) Authors who have only included patients with considerable distress have usually obtained incidence figures of 10—15 % (e.g. Bruusgaard (1946), Ramberg (1948), Capper and Butler (1951)).

Incidence figures similar to the latter two groups have been obtained by investigators who attempted to classify patients according to different degrees of severity.

4) Many authors gave results based on questionnaires without leading questions, or on personal experience without any systematic investigation. The figure sometimes given for the incidence of postcibal symptoms was up to five per cent (Lake (1948), Schoemaker (1949)). Figures obtained in this way cannot give a correct picture of the incidence of postcibal symptoms. They do however provide an illustration of the fact that many surgeons consider that postcibal symptoms are rare among the patients they have operated on.

In conclusion, I would like to stress once more that the wide variation in the incidence figures for postcibal symptoms reported in the literature is probably due to different questioning techniques and different opinions about what is to be included under the heading of postcibal distress. The differences observable in different case materials regarding the incidence of postcibal symptoms therefore seem to be, to a large extent, only apparent. For a clear picture of the incidence and severity of postcibal symptoms, personal interviews with leading questions are necessary. When such methods are used, the incidence of postcibal symptoms among patients partially gastrectomised for peptic ulcer is found to be high—as this investigation and some other data in the literature show.

The Influence of Sex, Age, Follow-Up Interval, and Type of Ulcer

The incidence of postcibal symptoms was similar in the 4 groups investigated—see Table III.

Table III. *Percentage distribution of patients with postcibal symptoms in the different groups.*

Grade of postcibal symptoms	"Karlskoga" (157 cases)	"Uppsala 46" (209 cases)	"B I" (83 cases)	"B II" (175 cases)	Total (624 cases)
pc 0	31.2	33.0	30.1	34.9	32.7
(pc)	26.1	26.8	28.9	23.4	26.0
pc 1	31.9	25.4	30.1	30.8	29.2
pc 2	7.6	12.4	7.3	8.6	9.4
pc 3	3.2	2.4	3.6	2.3	2.7
Total	100.0	100.0	100.0	100.0	100.0

Table III includes all 614 persons interviewed and 10 contacted by letter. The postcibal symptoms of these latter are shown in Table IV. *The following calculations refer only to patients personally interviewed.*

The different groups were however dissimilar in sex distribution, age at operation, and other respects.

Sex. In all groups the women had postcibal symptoms more frequently than the men. This is clearly shown by the results for the whole case material—see Table IV and Fig. 1.

For grade pc 0 the difference is 16.3 ± 4.2 %. For grades pc 1—3 the difference is 28.3 ± 4.8 % (respective percentages 35.9 ± 2.2 % and 64.2 ± 4.3 %). The differences are statistically significant.

Age at operation. In all groups, postcibal symptoms of grades 1—3 were less usual among persons whose age at operation was at least 60

Table IV. *The patients' grades of postcibal symptoms at follow-up.*

Grade of postcibal symptoms		Follow-up interval in years															Total	*Interviewed* %
		½<1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Men	pc 0	15	28[2]	17	20[1]	12	10	7	8	10	12	10[1]	14	2	9	4	2	180	35.8±2.2
	(pc)	10	21	22	16	9	7	5[1]	7	4	8	7	5[1]	2	11[1]	4	4	142	28.3±2.0
	pc 1	16	18	11	16	10[1]	8[1]	4	7	9	14[1]	3	3	6	4	1	2	132	26.3±2.0
	pc 2	7	5	4	6	1	2	1	3	1	4	2	1	1				38	7.8±1.2
	pc 3		1		3	1				2	1	1						9	1.8±0.6
Total men		48	73	54	61	33	27	17	25	26	39	23	23	11	24	9	8	501	100.0
Women	pc 0	1	1	3	4		2	1	4	1	1	4	2					24	19.5±3.6
	(pc)	2	1	1	2		3	1	1	1	4	2	1	1				20	16.3±3.3
	pc 1	1	9	4	3		2		7	2	4	6	3	4	3	1	1	50	40.6±4.4
	pc 2	5	2	2	2	2			1	2	2	1		2				21	17.1±3.4
	pc 3	1	2	2						1	2							8	6.5±2.2
Total women		10	15	12	11	2	7	2	13	7	13	13	6	7	3	1	1	123	100.0

[1] 1 case contacted by letter.
[2] 2 cases ,, ,, ,,

Numbers of patients personally interviewed:
pc 0: 200, *(pc):* 159, *pc 1:* 179, *pc 2:* 59, *pc 3:* 17.

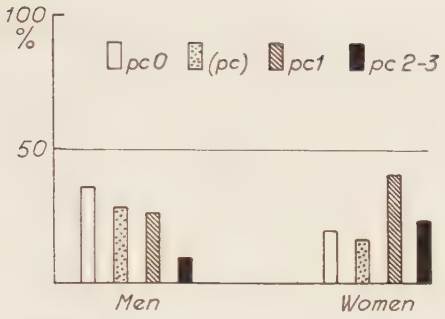


Fig. 1. Postcibal symptoms among men and women. Those not interviewed omitted. (Cf. Table IV.)

years. This was also evident for a group uniform as regards method of operation, consisting of men who had had a B II op. with retrocolic anastomosis (Table V).

There is a statistically probable difference for grades pc 1—3, if the patients are divided into those who were younger than 60 at operation and at least 60. (Difference: 22.6 ± 7.9 %. The respective percentages are 40.5 ± 2.8 % and 17.9 ± 7.4 %.)

Table V. *Percentage distribution of postcibal symptoms in different age-groups. Men with B II ops. and retrocolic anastomosis. Reoperated cases omitted.*

Grade of postcibal symptoms	Age-groups				
	Less than 30 years (39 cases)	30—39 years (110 cases)	40—49 years (88 cases)	50—59 years (69 cases)	60 years or more (28 cases)
pc 0	28.2 ± 7.3	28.2 ± 4.3	29.5 ± 4.9	36.3 ± 5.8	39.3 ± 9.4
(pc)	30.8 ± 7.5	30.0 ± 4.4	30.7 ± 4.9	24.6 ± 5.2	42.8 ± 9.5
pc 1	35.9 ± 7.8	28.2 ± 4.3	28.4 ± 4.8	30.4 ± 5.5	14.3 ± 6.7
pc 2—3 . .	5.1 ± 3.6	13.6 ± 3.3	11.4 ± 3.4	8.7 ± 3.4	3.6 ± 3.6
Total	100.0	100.0	100.0	100.0	100.0

Follow-up interval. The number of patients with each grade of postcibal symptoms at the time of the interview is shown in Table IV. Not until the follow-up interval after gastrectomy was at least 10 years did postcibal symptoms begin to be less usual. This is most clearly apparent if men who had the B II op. with retrocolic anastomosis are divided into groups with different follow-up intervals, as in Table VI.

The difference between the percentages of patients with postcibal symptoms of grades pc 1—3 interviewed less than 10 years after op. and at least 10 years after

Table VI. *Effect of follow-up interval. Percentage distribution of men with different grades of postcibal symptoms. Only B II op. with retrocolic anastomosis. Reoperated cases omitted.*

Grade of postcibal symptoms	Follow-up interval		
	½—4 years (189 cases)	5—9 years (83 cases)	10—15 years (62 cases)
pc 0	28.5 ± 3.3	30.1 ± 5.0	40.3 ± 6.2
(pc)	32.3 ± 3.4	22.9 ± 4.6	33.9 ± 6.0
pc 1	28.6 ± 3.3	33.7 ± 5.2	21.0 ± 5.2
pc 2—3	10.6 ± 2.2	13.3 ± 3.7	4.8 ± 2.7
Total	100.0	100.0	100.0

Table VII. *Distribution of postcibal symptoms in men operated on for gastric and duodenal ulcers. ("Karlskoga" and "Uppsala 46".)*

Grade of postcibal symptoms	Gastric ulcers		Duodenal ulcers	
	No.	%	No.	%
pc 0	21	38.2 ± 6.6	77	33.6 ± 3.1
(pc)	17	30.9 ± 6.2	64	28.0 ± 3.0
pc 1	12	21.8 ± 5.6	65	28.4 ± 3.0
pc 2—3	5	9.1 ± 3.9	23	10.0 ± 2.0
Total	55	100.0	229	100.0

is nearly statistically probable (15.7 ± 6.3 %. The respective percentages are 41.5 ± 3.0 % and 25.8 ± 5.6 %).

It was attempted at the interviews to find out whether the patients had any postcibal symptoms about ½ year after the op. The information obtained is not strictly reliable, but the percentage figures were similar in the different groups. 25 % of all patients were free from distress ½ year after op., and 60 % then had postcibal symptoms of grades pc 1—3. For the patients referred to in Table VI, the corresponding figures are 23 and 61 %.

Gastric and duodenal ulcers. The incidence of postcibal symptoms was about the same among men operated on for gastric and duodenal ulcers (see Table VII). The same applied to women.

Discussion

Men and women have in general not been differentiated in assessing postcibal symptoms. Muir (1949) and Capper and Butler (1951) found no sex difference, while Brun and Landelius (1947) and Pulvertaft (1952) observed that women have postcibal symptoms more often

than men. Pulvertaft, for instance, found that 43 % of women and 63 % of men reported no postcibal symptoms—a difference of the same order of magnitude as I have found. This sex difference is one of the reasons for the well-known fact, stressed by Perman (1935), among others, that the late results of gastrectomy are worse among women than among men.

The influence of the age at operation has been discussed by Capper and Butler (1951) and Pulvertaft (1952). They found no difference between different age groups (Pulvertaft's oldest group comprised patients 50—70 years old at operation, however). The lessening of postcibal symptoms which appears from my figures in patients at least 60 years old at operation may largely be due to the fact that older persons lead a more sedentary life and so need less food than younger people.

Many authors considered that postcibal symptoms disappeared after some months or years. However, Haberer (1925), and subsequently Custer *et al.* (1946), Capper and Butler (1951), Pulvertaft (1952), among others (see Table I), have stressed that the symptoms often remain undiminished for years. My figures show that there is a considerable decrease in the incidence of symptoms during the first years after the op., but after that no clear decrease is found until patients interviewed at least 10 years after op. are considered. The long-term variation of postcibal symptoms in the individual case will be dealt with more thoroughly in a later section (p. 64).

No definite difference was found among patients operated on for gastric or duodenal ulcers, a fact also stressed by Capper and Butler (1951) and Pulvertaft (1952). A definite difference might have been expected if the postcibal symptoms were mainly due to nervous or psychic disturbances. It is generally believed that such disturbances are more common among persons with duodenal ulcer than with gastric. Investigations by Wretmark (1953) give support to this view.

Postcibal Symptoms and Different Types of Partial Gastrectomies

There has been a lively discussion in surgical publications about the advantages and disadvantages of various types of partial gastrectomy. The question of postcibal symptoms has also been touched upon in this discussion.

Billroth I and Billroth II

The Chief Surgeon in Karlskoga used B I and B II ops. alternatively during 1942—45. The "B I" group was chosen for follow-up in order to obtain results for comparison with the "B II" group.

Table VIII. *Distribution of postcibal symptoms in B I and B II cases with retrocolic anastomosis. Only ops. from 1942—1945 in "Karlskoga" group and 1939—1943 in "B I" and "B II". Reoperated cases omitted.*

Grade of postcibal symptoms	"Karlskoga"		"B I" and "B II"		Groups combined			
					B I op.		B II op.	
	B I No.	B II No.	B I No.	B II No.	No.	%	No.	%
pc 0	14	9	19	29	33	42.8±5.6	38	37.6±4.8
(pc)	7	10	14	13	21	27.3±5.1	23	22.8±4.2
pc 1	7	10	11	20	18	23.4±4.8	30	29.7±4.5
pc 2—3 . . .	1	3	4	7	5	6.5±2.8	10	9.9±3.0
Total	29	32	48	69	77	100.0	101	100.0

The "B II" group includes only duodenal ulcer cases, but it has already been shown that there was no ascertainable difference between the incidence of postcibal symptoms among patients gastrectomised for gastric ulcers and for duodenal ulcers.

In order to obtain similar groups for comparison, cases of B II ops. with retrocolic anastomosis and of B I ops. performed during the same period have been selected. Furthermore, only men have been included —see Table VIII. The results were somewhat better for B I gastrectomies than for B II. But the difference is not statistically probable.

The largest difference is for grade pc 0 in the "Karlskoga" group, 20.2 ± 12.4 %. Among women operated in the periods given in Table VIII there was no difference between B I and B II.

The B II cases included 15 patients who had earlier undergone a B I op. 13 of these considered themselves able to judge whether there was any difference between their postcibal condition after the two operations.

4 reported no change, of whom 2 had no postcibal symptoms,

5 reported worse postcibal symptoms after the B II op., of whom 2 had had no symptoms after the B I op.,

4 patients reported milder postcibal symptoms after the B II op., of whom 1 was relieved of all symptoms.

B II gastrectomies of different types

Antecolic and retrocolic anastomosis. Both types of operation were represented in the "Uppsala 46" group. Each surgeon usually preferred a particular method; in other cases, the same surgeon used either method on different occasions. The results were somewhat better for patients with antecolic anastomosis than for those with retrocolic.

Table IX gives the incidence of postcibal symptoms in the two sections of this group. Only men are included. The difference between the percentages with no postcibal symptoms (grade pc 0) is statistically

Table IX. *Distribution of postcibal symptoms in men with retrocolic and antecolic anastomosis. "Uppsala 46" only.*

Grade of postcibal symptoms	Retrocolic anastomosis[1] No.	%	Antecolic anastomosis[2] No.	%
pc 0	30	28.3 ± 4.4	26	50.0 ± 6.9
(pc)	36	34.0 ± 4.6	12	23.1 ± 5.9
pc 1	28	26.4 ± 4.3	10	19.2 ± 5.5
pc 2—3	12	11.3 ± 3.1	4	7.7 ± 3.7
Total	106	100.0	52	100.0

[1] 2 cases with secondary vagotomy omitted.
[2] 1 case with secondary vagotomy omitted.

probable (Difference: 21.7 ± 8.2 %). There is no difference as regards the incidence of postcibal symptoms of grades pc 1—3 (D: 10.8 ± 7.7 %).

A similar variation occurred for grade pc 0 among women, and the same applied to men in the "B II" group, though there were very few cases of antecolic anastomosis in these groups.

Enteroanastomosis. Some of the patients in both the "Uppsala 46" and "B II" groups had enteroanastomosis together with retrocolic anastomosis. (Enteroanastomosis was always used with antecolic anastomosis.)

It will be seen from Table X that there was no difference between these two group sections as regards postcibal symptoms.

7 patients with enteroanastomosis (5.6 ± 2.1 %) and 19 without (17.9 ± 3.7 %) occasionally vomited after meals (cf. p. 47). The difference (12.3 ± 4.3 %) is statistically probable. It was usually a matter of regurgitation or vomiting of bile in the cases without enteroanastomosis, in other cases vomiting of food. It therefore seems that an enteroanastomosis may to some extent prevent regurgitation of bile.

Table X. *Distribution of postcibal symptoms in men with enteroanastomosis and without. Only retrocolic anastomosis included. Reoperated cases omitted.*

Grade of postcibal symptoms	With enteroanastomosis No.	%	Without enteroanastomosis No.	%
pc 0	41	32.8 ± 4.2	32	30.2 ± 4.5
(pc)	38	30.4 ± 4.1	33	31.1 ± 4.5
pc 1	33	26.4 ± 3.9	30	28.3 ± 4.4
pc 2—3	13	10.4 ± 2.7	11	10.4 ± 3.0
Total	125	100.0	106	100.0

Table XI. *Numerical distribution of postcibal symptoms among B II operated men with a valve and without. Only retrocolic anastomosis included. Reoperated cases omitted.*

Grade of postcibal symptoms	"Karlskoga" with a valve	"Uppsala 46" without a valve
pc 0	31	30
(pc)	30	36
pc 1	32	28
pc 2—3	10	12
Total	103	106

Stoma with a valve or without. "Karlskoga" cases with retrocolic anastomosis always had a valve incorporated and a stoma about 3 fingers wide. In the "Uppsala 46" group, on the other hand, the whole of the gastric section was joined to the jejunum, with few exceptions. None of the "Karlskoga" cases had enteroanastomosis, but, as mentioned above, this seems not to have affected the postcibal symptoms. It therefore seems justifiable to make a comparison between the two groups, with the reservation that two different hospitals were involved (see Table XI). As regards the incidence of postcibal symptoms, there is no difference.

Addendum. Anastomotic ulcers and late reoperations

The total case material includes 123 patients who had had a B I op. before 1946. Anastomotic ulcers were verified operatively in 13 cases, 10.4 % (calculated for a total of 125 patients.[1] If the patients who died of other diseases are included, the figure is 9.4 %).

"Karlskoga" group. 2 patients had had a second operation before the interview, on account of anastomotic ulcer.

At the time of interview, 2 patients had symptoms indicative of anastomotic ulcer, and 1 other had received hospital treatment on this diagnosis. These 3 patients were subsequently operated on, and the diagnosis confirmed.

"B I" group. 7 patients[1] had had a second op. before the interview on account of anastomotic ulcer. Another patient was suspected of having a new ulcer at the time of interview, and this was verified on operation 1 month later. (Another patient had a second operation (B II) 9 years after the first. He had postcibal symptoms, unpleasant hunger sensations, and some pain. Fibrosis was found, but no anastomotic ulcer. His postcibal symptoms disappeared after the second operation.)

Figure 2 shows the time which elapsed between the first, B I, operation and the second, always B II, for anastomotic ulcer.

(12 of the 13 patients were men, and 1 a woman. The primary reason for operation was gastric ulcer for 1 man, in the other cases duodenal ulcers.)

[1] Of these, 2 patients had died after reoperation for anastomotic ulcer (see Table II A).

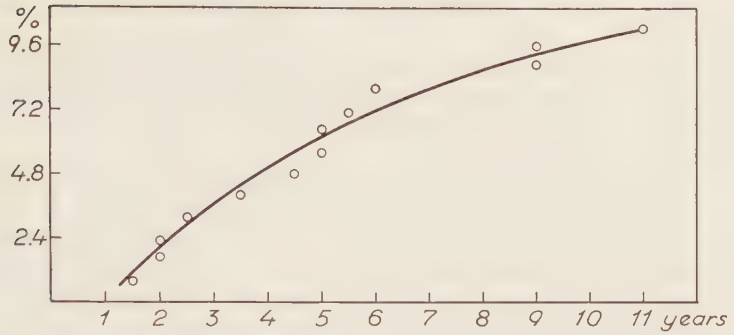


Fig. 2. B I cases reop. for anastomotic ulcer. Cumulative percentages plotted against time between B I op. and reop. Each circle corresponds to one case (= 0.8 %).

The number of anastomotic ulcers among the B I cases will probably increase in the future. The follow-up interval was relatively short for some patients, and moreover, clinical and radiological reasons suggested a new ulcer in 8 further cases, all of whom had received medical treatment for their anastomotic ulcers.

Among the B II patients who were operated on in the same periods and by the same surgeons as the B I (cf. p. 38), there was no case of a second operation for anastomotic ulcer.

A new ulcer was suspected in 2 cases in view of clinical and radiological findings. Actually, however, no operatively verified case of anastomotic ulcer occurred in either the "B II" group or the B II section of the "Karlskoga" group. The "Uppsala 46" cases included 3 patients who had undergone vagotomy one or more years after the first operation, for clinically diagnosed ulcers (in 2 cases also radiologically diagnosed). In each case the vagotomy was transthoracic, and there was consequently no proper verification.

The "B II" group includes one patient who had a B I op. 5 years after the primary operation, on account of soreness and ache in the abdomen, back pains —mostly at night—as well as tiredness after meals. This distress disappeared after the second operation. No ulcer was found.

Discussion

No distinct difference in the incidence of postcibal symptoms among patients with different types of partial gastrectomy was observed. It seemed that the results were somewhat better for patients with B II resection and antecolic anastomosis, and possibly those with B I resection, than for B II cases with retrocolic anastomosis. The only statistically probable difference obtained is between those with retrocolic and those with antecolic anastomosis, and then only regarding the percentage of patients quite free from postcibal symptoms. Whether or not there was enteroanastomosis was found to have no effect on the incidence of

postcibal symptoms, nor whether or not the new stoma was constructed with a valve.

As regards B I and B II gastrectomies, views differ widely. There are few authors who have been able to dispose of large numbers of B I and B II gastrectomies for comparison (cf. Table I). Two views predominate:

1) Postcibal symptoms occur about as frequently after B I ops. as after B II (Friedemann (1927, 1935), Bruusgaard (1946), Ramberg (1948), Goligher and Riley (1952), Wallensten and Göthman (1953)).

2) Postcibal symptoms occur much less frequently after B I ops. than after B II (Bohmansson (1926, 1927, 1950), Custer *et al.* (1946), Perman (1947), O'Neill (1950), Ross and Meadows (1952), and others). These authors suggested that this was due to slower emptying in B I cases. Capper and Butler (1951) never observed postcibal symptoms after B I gastrectomy, and they used this to support their theory that postcibal symptoms are due to stretching of the gastric remnant after a B II operation (cf. p. 18).

The different results obtained by different writers are hard to explain. It is possible that a special operative technique with B I gastrectomy may result in a low incidence of postcibal symptoms, but this question is still undecided.

Because of the higher incidence of anastomotic ulcer after Billroth I gastrectomy, the method seems to be on the decline—relatively speaking. 1/4 of the gastrectomies for peptic ulcer in Sweden in 1945 were of B I type—in 1950 1/7 (Rosenqvist (1953)). The figure for operatively verified anastomotic ulcer arrived at in the present investigation (10.4 %) is unusually high; this may be explained by the long follow-up intervals in the majority of cases and the fact that all cases were followed up. Several patients underwent reoperation years after the B I operation—up to 11 years after.

The present results for different modifications of the B II op. are on the whole in agreement with the findings of other authors (Hosford (1949), Capper and Butler (1951), Goligher and Riley (1952), and others). However, none of them found any difference between antecolic and retrocolic anastomosis; indeed, the differences in my series are relatively small in this respect.

Patients with enteroanastomosis might have been expected to suffer more often from postcibal symptoms than those without, if the theory advanced by Roux *et al.* (1950) and Wells and MacPhee (1952), that postcibal symptoms are primarily due to afferent loop stasis, were correct.

My results regarding stoma with a valve or without are in conformity with those of Hosford (1949) and Capper and Butler (1951), as regards the conclusion that the construction of a valve has no effect on the incidence of postcibal symptoms (cf. p. 13).

Of recent years, there have been recommendations—especially in British journals—of various modifications of the B II op. designed to lessen the incidence of postcibal symptoms, usually by retarding the emptying of the gastric remnant. Porter and Claman (1949) made a very small stoma (2.5 cm), and O'Neill (1950) a central stoma with valves adjacent to both the greater curvature and the lesser. Wells and MacPhee (1952) constructed a type of pantaloons anastomosis, earlier proposed by Steinberg (1949). Capper and Butler (1951) supported the gastric remnant with a special technique. Moroney (1951) and Lee (1951) implanted a colonic segment between the gastric remnant and the duodenum, and Henley (1952) a segment of jejunum.

The respective authors have all stated that the incidence of postcibal symptoms was considerably lower in cases with their modification than in cases with ordinary B II gastrectomies. Goligher and Riley (1952) carried out small trial series with the techniques of Porter and Claman and of Moroney but they formed the impression that these patients did not fare much better symptomatically than those with ordinary gastrectomy. It would seem that further experience with the various modifications is necessary before stating any definite conclusions.

Postcibal Symptoms among Patients Operated on by Different Surgeons

The "Uppsala 46", "B I" and "B II" groups were divided up according to the different surgeons operating. There were 8 surgeons who had performed at least 25 ops. each. There are certain differences between the results attained by the different surgeons. For instance, the percentage of patients with postcibal symptoms of grades pc 1—3 in the 8 groups varies from 30 to 60.

Examination of the different surgeons' cases show that the different results depend mainly on the percentage of women included, and on whether antecolic or retrocolic anastomosis was used in the B II op. Surgeons who sometimes performed retrocolic anastomosis and sometimes antecolic all attained better results with antecolic anastomosis.

4 surgeons performed more than 20 ops. with retrocolic anastomosis. Differences in the incidence of postcibal symptoms are unimportant.

It appears therefore that as regards postcibal symptoms, the operative method was more important than who operated.

It is also of interest that there is no difference between patients from Uppsala and Karlskoga with the same kind of gastrectomy (see, for instance, Table XI). The Uppsala patients were largely engaged in agriculture, while those in Karlskoga were in industry.

Postcibal Symptoms and Gastric Acidity

No systematic use was made of test meals in the present investigation.

However, some of the patients in the "B II" group had test meals with coffein in 1946 in connection with Spak's investigation (for details, see Spak (1948)). Although about 5 years had passed between that investigation and my interviews, it was possible to obtain some information provided that only patients who said they never had postcibal symptoms after the operation and those who had had symptoms of grades pc 1—3 ever since the operation are taken into account. See Table XII.

The difference between the two groups as regards presence of free acid is not statistically probable (D: 18.3 ± 9.5 %). The result agrees on the whole with Pfisterer's findings (cf. p. 17).

Table XII. *Postcibal symptoms and gastric acidity. Cf. text.*

Information from interviews	No. of cases	Cases with free acid 1946 No.	%
Never had postcibal symptoms	42	18	42.9±7.7
Since op. had postcibal symptoms of grades pc 1—3	61	15	24.6±5.5

The conclusion which may be drawn is that postcibal symptoms can be found in patients with free acid in the gastric remnant after test meals and in those without.

CHAPTER 4

Symptomatology

The literature contains several detailed descriptions of cases with postcibal symptoms (e.g. Bruusgaard (1946), Culver (1949)), and Capper and Butler (1951) and Rauch (1952) showed in tables the distribution of various symptoms. But there is no thorough account of the postcibal symptomatology, which is quite distinctive in many respects. The following survey is based on information obtained from interviews, and on observations of gastrectomised patients after meals. No standard meal was given; patients received food to which they considered themselves sensitive, especially gruel and milk (sometimes in connection with radiological examination). Postcibal symptoms of various grades of severity occurred in 77 of the 143 cases who were observed during and after a meal.

Table XIII includes the more important of the symptoms that may occur after meals. As shown in the table, the incidence of the various symptoms is higher in the groups with more severe symptoms.

Drowsiness, tiredness, sleepiness or *faintness* were prominent symptoms, ranging from slight drowsiness to an irresistible need of sleep. The patient might even fall asleep at the dinner table. Even where the drowsiness or tiredness were slight, the feeling was uncomfortable, quite different to the drowsiness anyone can experience after a substantial meal.

Case 12. K 1446/47. Metal worker, underwent B II (r. c.) op. for duodenal ulcer at age of 49. Interviewed 1 year later. He became tired after meals, and after heavy meals had difficulty in keeping awake—particularly marked after oatmeal gruel. Weighed 5 kg less than his average preop. weight. *Grade pc 1.* He was given a test meal on a fasting stomach. He sat the whole time.

Time mins.	Pulse beats/min.	Bl. press. mm Hg	
—	82	130/90	Before meal.
0			Began eating ½ l oatmeal gruel and 2 sandwiches.
7			Finished eating. Quite replete, but felt all right.
13			Began to feel sleepy. Warm in abdomen.
17	84	150/110	Fell asleep on chair. Had to be supported to avoid falling off the chair.

18		165/100	Asleep.
20	84	160/100	Wakened. Extremely sleepy, and fell asleep once more. Forehead slightly damp.
30	94	150/95	Had awakened and fallen asleep again a couple of times. Now somewhat better. Warm and heavy in abdomen. Skin dry.
43	88	145/85	Had again fallen asleep, but was wakened and sat in an easy chair. Slept ½ hr. and awoke
78	88	145/85	quite recovered.

Most typical was faintness in the form of general muscular weakness; the patients felt "unable to do anything", "like a jelly", "ready to faint", their arms felt powerless or as if paralysed, and the handclasp was often noticeably weak. Some patients did actually faint after eating.

Nausea. As a rule it was not nausea with a tendency to sickness and vomiting, but an unpleasant, "queer" feeling of discomfort in the

Table XIII. *Incidence of different symptoms among 414 patients with postcibal distress of different grades.*

Type of symptom	159 cases with grade (pc)	179 cases with grade pc 1	76 cases with grades pc 2–3
General symptoms:	%	%	%
Weakness, tiredness	84	97	100
Nausea, or a feeling of uneasiness in abdomen	63	72	79
Abdominal symptoms:			
Feeling of distension, pressure or heaviness	66	77	71
Regurgitation or vomiting	17	19	39
Diarrhoea or looseness of bowels	15	13	25
Pain	6	10	21
Vasomotor symptoms:			
Feeling of warmth	40	62	71
Sweating or moist skin	41	56	61
Palpitations	16	44	62
Other symptoms:			
Headache, or pressure in the head	7	12	30
Dizziness, mental confusion	11	18	41
Dyspnoea	9	18	37
Polyuria	3	8	12
Urticaria, vasomotor rhinitis, itching, etc.	1	4	12

abdomen, for which the patient could not find suitable words, and for lack of better called a feeling of sickness, "but not the sort of sickness where you want to bring up anything".

Feeling of pressure, distension and *heaviness in the abdomen* were common symptoms, usually mild, but sometimes the distension was strong, and necessitated loosening of the clothes.

Case 13. K 240/48. Joiner, underwent B II (r. c.) op. for duodenal ulcer at age of 36. Interviewed not quite 1 year later. He felt somewhat ill after eating, and sometimes vomited, especially after pastry, gruel, or mashed potatoes. Sometimes immediately after a meal it felt as if his abdomen "stopped suddenly like a clock", his abdomen swelled up like a balloon, and became so tight he thought he would burst. After at the most an hour it began to gurgle and move, and the trouble passed over. *Grade pc 1.*

On being asked again 4 years after the operation, he said he still had the same trouble, but only with milk dishes.

In some patients, the feeling of distension was accompanied by forceful *belching,* which might be very embarrassing.

Vomiting. Some patients suffered from vomiting, but only occasionally, and usually it was not severe—a bitter-tasting yellow lump or a little bile was brought up as a rule. Vomiting of larger amounts of food or bile (as in case 8) was less common. A few patients provoked vomiting by putting fingers down the throat. As Boller (1947) and Pulvertaft (1952) have pointed out, spontaneous vomiting is mostly just regurgitation.

Case 14. U 865/41. Woman who underwent B I op. at age of 41. Interviewed 11 years later. About once a week, 4—5 mins. after a meal, her abdomen became tight, she felt sick and faint, and her heart thumped. When she bent down to vomit, it just ran out, so to speak—mostly bile at first, but a little food afterwards. This occurred especially after milk, gruel, or fruit soup. Weighed 5 kg more than her average preop. weight. *Grade pc 1.* When she had attacks of migraine she was also "properly sick", as she had been before the operation.

Gurgling and heaving in the abdomen were fairly common, especially when the symptoms began to abate. Some patients, however, said that *their abdomen seemed to stop still* (see, e.g., case 13).

Diarrhoea after meals was most common during the first months or years after the operation. Sometimes the postcibal attack finished with diarrhoea, sometimes diarrhoea and other postcibal symptoms occurred alternatively, and sometimes the diarrhoea was isolated, in this case usually after special foodstuffs.

Case 15. U 749/38. Stoker, underwent B II op. (r. c.) for duodenal ulcer at age of 38. Interviewed 13 years later. He became listless if he drank milk, and if he drank milk-cocoa his abdomen gurgled and he got violent diarrhoea a few minutes later. Weighed 5 kg less than his average preop. weight. *Grade (pc).*

Aches and *pains* in the abdomen occurring postcibally were usually not severe. Some patients described the distension as a bursting pain. Others experienced sharp pain, soreness, or a dull ache most often in the lower epigastric region or somewhat to the left of the umbilicus. Only 2 % of all patients (nearly all belonging to grades pc 2—3) had appreciable postcibal pain sometimes. Otherwise, it was typical that patients described the pain as hardly noticeable compared with the ulcer pain before the operation, and the majority of patients said that the abdominal distress they got after eating could not be described as an ache or a pain.

A *feeling of warmth* might vary from a slight hot feeling in the face to a marked sensation of fever. The warmth was often first felt in the abdomen, subsequently spreading rapidly over the whole body, often coming in waves. Some patients "simmered" with heat, and the heat moved up to the head, often giving rise to *flushing of the face*. Some patients thought they had fever or 'flu, and had several times taken their temperature, only to find to their surprise that it was normal. Patients could sometimes feel warm but nevertheless be pale.

Pallor was more common than flushing, and prevalent where there was marked faintness.

Sweating might be no more than a slight moistness of the forehead or so heavy that the patient had to change underclothes afterwards (see case 43). Gustatory reflex sweating, due to eating spicy foods, has not been counted as pathological in this connection.

In several cases with severe postcibal symptoms the sensation of warmth was succeeded by a *sensation of cold,* sometimes with noticeable goose-flesh (e.g. case 10).

Palpitations occurred when there was distension in the abdomen, with a feeling of pressure near the heart. Palpitations could also occur with extreme faintness, and often with marked vasomotor symptoms. The patient then felt that his whole circulation was hard at work, and that there was a strong upward pressure in his throat and head.

Case 16. U 3996/42. Business man, underwent B I op. for duodenal ulcer at the age of 32. Interviewed 9 years later. He used to eat all kinds of food, but preferably not milk, gruel, milk chocolate, etc. 10 mins. after such food he felt tired, ill and feverish. Sweat ran from his forehead. There was tightness and pressure in his head, his heart thudded heavily, and it felt as if the blood throbbed in all his veins. His abdomen became somewhat uneasy, but otherwise he had no abdominal discomfort. The symptoms might continue for 1 hr. or so. Weight the same as average preop. weight. *Grade pc 1.*

He was given a test meal in connection with radiological examination. He was examined standing.

Time mins.	Pulse beats/min.	Bl. press. mm Hg	
—	86	110/75	Before taking contrast meal.
0			Drank 300 ml contrast meal with milk gruel. Felt slight uneasiness in abdomen a few mins. later.
7	104	125/80	Had had palpitations for the past few minutes and felt listless.
18	118	150/95	Forehead moist, whole body sticky, unpleasant feeling in abdomen.
23	112	150/100	Sweated increasingly, head felt heavy, drowsy.
29	114	150/100	Felt warm, pressure in head, and throbbing throughout the body.
31	114	140/90	Skin dry. Felt better. Tired. Lay down 11 mins., and then stood up again.
44	100	120/85	Felt much better. No discomfort in abdomen.
63	102	110/70	No discomfort.

Many patients themselves noticed that their *pulse* was both fast and heavy. There was regularly tachycardia after a positive test meal. Some patients had been so worried by palpitations that they had consulted a doctor.

The *blood-pressure* was checked in connection with test meals in some cases. The patients were either sitting or standing for examination. Postcibal symptoms were accompanied either by a rise in the blood pressure (cases 12 and 16) or by a fall.

Case 17. U 1112/49. Man who underwent B II (r. c. + e. a.) op. for duodenal ulcer at the age of 47. Interviewed ½ year later. Every day after meals he felt faint, moist, warm, had palpitations and headache, and his abdomen felt distended. He usually had to lie down for about an hour. *Grade pc 3.*

Time mins.	Pulse beats/min.	Bl. press. mm Hg	
—	88	115/80	Before meal. Sitting.
0			Began to eat an ordinary meal—meat balls, mashed potatoes, fruit soup, and cream. Also drank milk.
11			Finished eating. His stomach was so full that the food was "up in his chest".
14	104	105/70	Had been warm all over for some mins. Face hot and flushed. Felt weak. Hand clasp weak.
18		110/70	Head felt empty. Tightness in forehead. Abdomen full to bursting.
32	110	100/60	Listless, limp, and hot in the face the whole time.
54	98	95/60	Muscular weakness much diminished, less tired. Still some pressure in the forehead.
65	96	95/60	A little tired, otherwise recovered.

He thought the symptoms during the test much milder than usual.

A sharp fall in blood-pressure was observed in connection with severe symptoms of a shock nature. The pulse was then scarcely detectable, usually rapid, but slow in one case where the shock was particularly severe.

Case 18. U 226/52.[1] Woman who underwent B II (a. c. + e. a.) op. for duodenal ulcer at the age of 37. Examined 8 months after op. She became faint, felt sick, had palpitations, and her eyes watered, 15—30 mins. after every meal. No abdominal distress. Usually had to lie down for 1/2 hr. after meals. She had had urticaria several times before op. *Grade pc 3.* She was given a test meal in connection with radiological examination. Examined standing.

Time mins.	Pulse beats/min.	Bl. press. mm Hg	
—	98	125/75	Before meal.
0			Drank 200 ml contrast meal with milk gruel, lying down.
8			Stood up.
18	110	125/75	Tired, and had been sweating for a couple of mins. Began to feel ill. Eyes watered.
24	108	130/80	Flood of tears. Felt sick and faint.
27	119	130/80	Still fainter. Palpitations.
35	128	Not measurable	About to faint, allowed to lie down. Felt no better lying down. Very faint, but gradually recovered. Still tired when she stood up again.
79	128	110/95	Again faint after some minutes; had to rest a while, but recovered quickly.
82	104	105/75	Felt better. Allowed to lie down and rest.
132	106	110/80	Only somewhat tired.

Case 19. K 1547/44. Builder's carpenter, underwent B I op. for duodenal ulcer in 1944 at the age of 30. Subsequently severe postcibal symptoms *(grade pc 3).* Reoperated 1946 (B II (r. c.)) for anastomotic ulcer. Vagotomy 1947, in an endeavour to cure his postcibal symptoms, which did not improve, however. Interviewed 1949. 10—15 mins. after each meal he became warm, tired, hot and red in the face, had palpitations, felt soreness and aching in his stomach. He gradually became more tired, pale, sweaty, dizzy, and had several times fainted, and sometimes his eyes smarted and he got small urticarial wheals in the face. His body had become rigid all over on some occasions. The symptoms continued 1—2 hours. Fluid food gave most trouble, particularly milk and milk dishes, which he hardly ever took. He was always tired and almost totally incapacitated. Weighed 10 kg less than his average preop. weight.

A test meal produced the following effects.

Time mins.	Pulse beats/min.	Bl. press. mm Hg	
—	76	120/75	Before the meal. Sitting.
0			Quickly drank 450 ml milk.
5	92	115/75	Slightly warm, light palpitations, somewhat faint. Small pains in lower abdomen.
10	90	115/70	Increasing faintness, slightly dizzy, face flushed.

[1] Not belonging to series previously mentioned.

15	88	110/65	Faint and dizzy. Pain in lower abdomen, but no tightness.
19			Stood up.
22	112	120/75	Still standing. Tired and warm.
26	72	75/60	Rather suddenly became very faint, hot and sweaty. Pulse, which had previously been heavy and rapid, became weak and slow. Sat down.
32		50	Increasingly pale, greyish in the face, sweating, pupils enlarged. About to faint. Allowed to lie down.
35		70	Lying down.
37	52	85	Still lying down. Slow, meagre pulse. Greyish pallor, very faint, some pain in abdomen.
41	58	120/80	Felt better, but faint and pale. Sat up again.
45	76	110/60	Sitting. Gradually recovered.
50	72	120/75	Sitting. Still tired.

Patients' blood-pressures were measured in connection with 42 test meals. The initial value of the systolic pressure varied between 110 and 135 mm Hg. The changes which occurred on account of the meal are shown in Table XIV.

Table XIV. *Change of blood pressure in gastrectomised patients due to meals.*

Postcibal symptoms after meal	Change of blood pressure after the meal Mm Hg				
	− 25 or more	− 15 to − 20	− 10 to + 10	+ 15 to + 20	+ 25 or more
None	–	–	5	–	–
Insignificant or mild	–	–	6	6	–
Moderate or severe . . .	3	2	8	6	6

Herrick and Sheard (1935) showed that the blood-pressure of healthy persons usually rises by 5—15 % after a meal, and that the pulse rate increases by 10—20 %. Patients who had only very slight postcibal symptoms or none at all after the test meal showed a small rise in blood-pressure, 5—10 mm as a rule, and a slightly increased pulse rate, or the blood-pressure and pulse remained unchanged.

Headache was usually felt as pressure or tightness in the forehead or nape of the neck, or sometimes more as a feeling of heaviness in the head. The headache could often be quite troublesome.

Case 20. K 184/47. Builder's labourer, underwent B II (r. c.) op. for duodenal ulcer at the age of 47. Interviewed 2 years later. At first he was very careful about his food, and experienced no discomfort. When he recommenced work, he

had no time to rest after some meals, and needed to eat more. Distress after meals began then, and had continued unchanged ever since. He became listless and tired, sweated, felt sick, and almost immediately after eating got an oppressive pain in his forehead. The headache sometimes continued for hours, and made it difficult to work. He dared not eat more than a little at work. If he ate three ordinary meals a day, he had headache three times a day. The distress occurred particularly after milk, gruel, cakes, and much butter. Weighed 10 kg less than his average preop. weight. *Grade pc 2.*

Dizziness occurred in association with faintness, but also with heavy palpitations or pressure in the head. Patients sometimes felt *dazed*, "poisoned", so that they could not speak distinctly, or had difficulty in understanding what was said to them.

Polyuria. Patients sometimes micturated repeatedly, with clear, colourless urine, while postcibal symptoms were present or when they had passed over (case 26). Patients considered that the amount of urine passed was much greater than the amount of liquid they had taken with the meal.

Shortness of breath, a feeling that it was impossible to get sufficient air, might be experienced when the abdomen was distended and pressed upwards on the chest, when the heart was beating fast, or in connection with marked faintness. A slight *feeling of anxiety* might occur at the same time.

Dryness of the mouth was sometimes experienced in connection with postcibal distress.

In 3 cases patients said that they had had postcibal *cramps.* One such case was actually observed. The cramps were of tetanic type, and seemed to be due to hyperventilation brought on by intense nausea.

Some patients had postcibal symptoms which could be attributed to *allergy.* The number of patients with suspected postcibal allergic symptoms was 20, from the total series. There were 3 with *urticaria,* 2 with *localised itching,* 2 with *smarting and redness of the eyes*—one of whom also had slight facial urticaria, 1 with a *prickly sensation in the nose,* 1 with *left-sided headache and weeping from the left eye,* 11 patients with *nasal drip* of varying degrees—of whom 3 had *vasomotor rhinitis,* and 3 *marked rhinorrhoea.*

The case histories of some of these patients are given below:

Case 21. K 471/42. Plumber, underwent B I op. for duodenal ulcer at age of 23. Interviewed 5 years later. Ever since the op. he had had postcibal symptoms (faintness, nausea, feeling of warmth and sweating, palpitations and tightness in the abdomen), if he ate much, or certain dishes (milk, milk dishes, soups, fruit soup, chocolate). Sometimes concurrently or a little later nettle rash ap-

peared all over his body, particularly on his face. Sometimes after meals he had urticaria by itself. This distress now occurred more seldom. Weight the same as average preop. weight. *Grade (pc).*

Case 22. U 1676/46. Lorry-driver, underwent B II (r. c.) op. for duodenal ulcer at age of 31. Interviewed 3 years later. Since op. he had had undiminished postcibal symptoms after almost every meal (tiredness, nausea, an ache in the abdomen, and shortness of breath; sometimes slight vomiting). Concurrently intense itching in the right armpit. The distress lasted about 30 mins., the itching almost as long. Occasionally he had dry eczema in the armpit but itching only with postcibal symptoms. Most discomfort after milk. *Grade pc 2.*

Case 23. U 2978/48. Forestry worker, underwent B II (r. c. + e. a.) op. for duodenal ulcer age of 58. Interviewed 1 year later. During the first 1/2 year after the op., he became uneasy, hot about the body, and had palpitations, if he ate gruel in the morning. He sweated a good deal at the same time, but after 10 mins. he felt quite cold instead, and had an attack of sneezing accompanied by itching and running nose. The discomfort disappeared after 10—15 mins. His condition soon improved, and he could now eat gruel without any trouble. Weight the same as average preop. weight. Now *grade pc 0.*

Case 24. U 2838/46. Farmer, underwent B II (r. c.) op. for duodenal ulcer at age of 63. Interviewed 3 years later. Could not take milk or milk dishes, and could not eat meals more than half as large as before the op. Had almost daily postcibal symptoms (tiredness, feeling of warmth, sweating, flushed face, slight nausea, tightness in the abdomen), which appeared immediately after eating and disappeared 15 mins. later. At the same time his nose ran, his left eye became slightly red and tears ran from it; sometimes sneezing and itching in the nose. He had these symptoms of rhinitis even before the op., but they were not then associated with meals. Now worse, and usually occurred after meals. *Grade pc 1.*

Case 25. U 1738/48. Farmer's wife, underwent B II (r. c. + e. a.) op. for duodenal ulcer at age of 36. Interviewed 1 1/2 years later. Since the operation, soon after meals she became faint, hot in the face, had palpitations, pressure in the head, and felt queer. She also had a prickly feeling in her nose, just as if she had caught a cold. She felt sick, and was accustomed to put fingers down her throat in order to vomit when the distress began. All the symptoms usually disappeared after 15—30 mins. The prickly sensation in her nose occurred regularly together with the other symptoms after she had drunk milk—less regularly after other food. Weighed 10 kg less than her average preop. weight. *Grade pc 2.* Her condition was unchanged 4 years later.

Case 26. K 2037/44. Floor-layer, underwent B II (r. c.) op. for duodenal ulcer at age of 35. Interviewed 7 years later. He sometimes had postcibal symptoms 5—10 mins. after a meal (listlessness, uneasiness, feeling of warmth, sweating, palpitations, slight dyspnoea). At the same time irritation of the eyes, which became bloodshot, and swellings the size of a pin-head appeared around the eyes, on his forehead and neck. He had to urinate 2—3 times, with copious clear urine. All symptoms ceased after 1/2—1 hour. They occurred particularly after milk, cream, pastries, and fresh apples. Weight the same as average preop. weight. *Grade pc 1.*

See also cases 19 and 43, pp. 50 and 80.

With a few exceptions, these symptoms occurred only postcibally, and ceased when the other postcibal symptoms disappeared.

External examination of the abdomens of patients suffering from postcibal symptoms often discloses a pressure-sensitive region about 2—3 cm to the left of the navel and a little lower down. Porges (1947)

has pointed out that soreness in this place is common among patients with jejunitis, both operated and unoperated cases. Some of the patients examined had a large scar hernia but there is nothing to indicate that this had any influence on the postcibal symptoms.

The symptoms usually commenced 5—15 mins. after meals. It was unusual for them to start during the meal. The time between the end of the meal and the onset of the symptoms often varied for the same patient on different occasions. Cases do occur where typical postcibal symptoms first commenced up to an hour after the meal.

An attack of postcibal symptoms might *last* from 10 mins. up to some hours and it was typical that patients recovered quickly from the attack, occasionally with some tiredness afterwards. When the symptoms were fairly severe, patients usually liked to be alone for a while and found it preferable to lie down. If they lay down before the symptoms started they avoided or mitigated the discomfort, but if they lay down after the symptoms had begun they felt relief although the discomfort usually continued. If a patient tried to stay up in spite of a strong desire to rest, the distress was often worse, and continued longer. If a patient ate lying down and afterwards rested $^1/_2$—1 hour, he usually experienced less discomfort or none at all, even if the symptoms were ordinarily severe. When the symptoms were slight, the patient often felt better if he moved about.

Discussion

Taken as a whole, the postcibal symptoms present an involved picture. Most cases had symptoms in common. These were weakness or tiredness, a queer feeling of uneasiness or nausea, some vasomotor symptoms, and a feeling of fullness, distension or pressure in the abdomen.

Other abdominal symptoms—vomiting, borborygmus, diarrhoea, and pain—occurred less often. They were most usual among patients with pronounced postcibal symptoms (grades pc 2—3). The same applied to other symptoms, such as headache, dizziness, mental confusion and shortness of breath.

The above symptoms are those ordinarily mentioned in the literature. Other symptoms reported by my patients have only occasionally been mentioned. Berkman and Heck (1945), for instance, said that there might sometimes be rhinorrhoea and noticeable gooseflesh, Culver (1949) that cases of convulsions have been reported, Bruusgaard (1946) mentioned dryness of the mouth, and Gordon-Taylor *et al.* (1929) postcibal diuresis. As far as I know, such symptoms as urticaria, localised itching, soreness and redness of the eyes, have not been reported as postcibal symptoms.

It was usually weakness, tiredness, and a feeling of sickness that

temporarily rendered the patient incapable of any exertion. But vasomotor symptoms or headache often distressed the patient considerably.

Views as to the behaviour of the blood-pressure vary considerably (cf. p. 15). Some investigators recorded an increase while the symptoms were present, others a decrease. The present investigation shows that sometimes the one occurs, and sometimes the other. Where patients do not have symptoms after meals, the change in the blood-pressure is small.

Many authors attempted to classify symptoms as various clinical syndromes. Hoffman (1939, 1952), for instance, divided the "dumping syndrome" into: nutritive gastrojejunitis with bile vomiting as the chief symptom; non-regulated rapid emptying of the stomach where there were faintness and vasomotor symptoms without abdominal symptoms; symptoms of the small stomach—a feeling of fullness—; and diarrhoea. Wells and Welbourn (1951) gave 5 variants of post-cibal syndromes; the efferent-loop syndrome where symptoms of sleepiness and a feeling of fullness predominated; the afferent-loop syndrome with vomiting of pure bile or pancreatic juice and pains to the right of the abdomen; afferent-loop reflux with vomiting of food mixed with bile; gastric distension with fullness, nausea and vomiting of food; and finally, isolated postprandial diarrhoea. Several other authors have put forward similar classifications (Allen and Welch (1946), Boller (1947), and others).

I have found it difficult to classify my case material in any such way. Patients quite often reported a wide variety of symptoms of, for example, grade pc 2 soon after the op. The symptoms became milder in due course, and at the time of interview there might be only a slight feeling of sickness and tiredness, or just diarrhoea after meals, or just vasomotor symptoms. Furthermore, a patient might have symptoms of different severity on different occasions, sometimes slight with merely a feeling of queasiness and listlessness, sometimes more severe, with a feeling of warmth and palpitations or even vomiting and aches. It is true that there were cases where tightness in the abdomen and pains, for example, were the dominant symptoms; but other patients could have the same symptoms in conjunction with vasomotor or other symptoms. It therefore seemed impossible to associate the subjective symptoms with a definite causal classification.

CHAPTER 5

Factors Influencing Established Postcibal Symptoms

Several different factors, especially those related to meals, have an important influence on the severity and frequency of postcibal symptoms.

The size of the meal

The newly gastrectomised patient felt that his stomach was small, and that it quickly became full. Patients without postcibal symptoms soon increased their capacity, and after some weeks or months they were eating ordinary meals again, e.g. meals roughly as large as those they had eaten before the operation. In some cases, however, the capacity remained small.

Case 27. U 498/45. Warehouse worker, underwent B II (r. c. + e. a.) op. for duodenal ulcer at age of 30. Interviewed 6 years later. He had never had postcibal symptoms, but became rapidly replete, and ate much smaller meals than before the op. Nevertheless, he could eat till it was impossible to swallow another morsel without feeling any other distress. Weighed 10 kg more than his average preop. weight. *Grade pc 0.*

A diminution of capacity was more common the more severe the patient's postcibal symptoms (Fig. 3 A). Of those with definite postcibal symptoms (grades pc 1—3), 72 % thought that they had to eat meals 3/4 as large as before the op., or usually even less, if they were to avoid postcibal symptoms.

Most of these knew quite definitely when they had eaten sufficiently. One spoonful or one bite more was suddenly too much. They had to finish eating if they were to avoid discomfort; otherwise, they felt that they had eaten too much, and the inevitable postcibal symptoms followed in due course. "Too much" for the partially gastrectomised patient, though, means considerably less than what persons in good gastric health call a lot of food.

Others learned from experience what was the safe limit for them. If they exceeded this limit unconsciously, they might get an unexpected attack, sometimes on quite inappropriate occasions. The patient soon learned to adjust the size of his meals to his restricted capacity. Usually, the after-dinner dessert was sacrificed. Others took a pause of

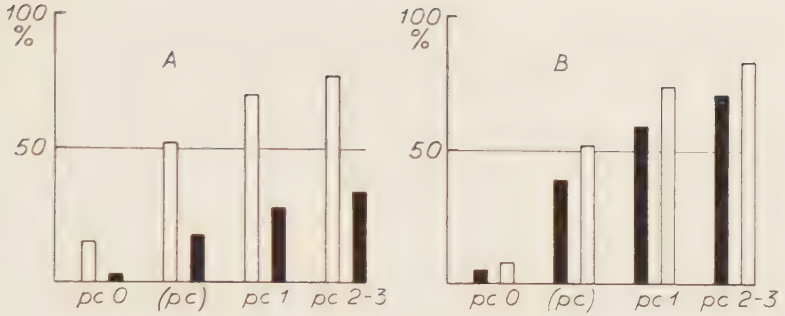


Fig. 3. Various factors relating to meals. For number of patients of each grade of postcibal symptoms, see Table IV.

□ = could not eat meals larger than at most $^3/_4$ the ordinary size before op.

■ = preferred dry solid food without liquids.

■ = did not tolerate milk (cf. Table XV).

□ = did not tolerate milk and/or milk food.

$^1/_2$—1 hour between courses, and then experienced no distress. It was sometimes necessary to increase the number of meals per day, and persons with very small capacity preferred to eat a little now and again throughout the day.

Consistency of the meal

30 % of patients with definite postcibal symptoms (grades pc 1—3) found that they felt better on dry food of solid consistency than on food such as purées or thinner fluids (Fig. 3 A). It was very common that such patients could eat considerable quantities of solid food without discomfort, whereas they felt full and postcibal symptoms appeared if they ate relatively small quantities of fluid food. Some found that drinking with meals or any rather thin fluid dessert after more solid dishes brought on the distress.

Postcibal symptoms depending on the consistency of food were not often noticed by patients. Many examined for postcibal symptoms were advised to eat only solid food, and to drink between meals. They regularly reported that they felt better after following this advice.

Thin fluid food or something to drink with meals was preferred by 5.9 % of the patients with definite postcibal symptoms.

The kind of food

All patients were asked whether milk or milk foods agreed with them (Fig. 3 B). "Milk foods" was taken to include gruel or porridge

Table XV. *Intolerance for different foods. The figures are derived from the whole of the "Karlskoga" (K) and "Uppsala 46" (U) groups.*

	%
Milk (pasteurised, 3 % fat) (K + U)	42
Sour milk (acidified by Streptococcus lactis) (K)	10
Gruel (K + U)	37
Pastries, cakes (K + U)	18
Pancakes (K + U)	17
Sweet soups (K + U)	13
Eggs (K + U)	11
Cabbage soup (K)	8
Fatty foods (K + U)	6
Pea soup (K)	4
Smoked foods (K)	2
Raw fruit (K)	2
Meat (K + U)	2

made with milk, pancakes, puddings and other dishes where milk was used. 47 % of those interviewed were careful about milk and milk foods, or avoided them altogether. (A few patients did not drink milk, either because they had never liked it or because they had lost the taste for it after the operation.)

Intolerance for milk and milk foods varied considerably from person to person, and even for the same person on different occasions. Some experienced discomfort after 2 glasses of milk, for instance, while others did not tolerate even ½ glass (case 5). Sour milk (see Table XV), buttermilk, and artificially curdled milk was better tolerated than milk; boiled milk was sometimes tolerated but not unboiled, and vice versa. Gruel made with water often gave no trouble, whereas gruel made with milk gave rise to symptoms. Oatmeal gruel seemed particularly troublesome.

It may be that milk sometimes caused distress because of its fluidity, but in many cases it could be successfully replaced by some other drink.

Many patients who stated that milk or milk foods did not affect them found after the interview that their postcibal symptoms lessened if they gave up milk.

"Karlskoga" patients were questioned in detail about their tolerance for other kinds of foods, and "Uppsala 46" patients about certain foods. The results are given in Table XV.

Sweets (pastries, cakes, sweet soups etc.) provoked postcibal symptoms in nearly 20 % of all patients. Many patients experienced no discomfort from cakes by themselves, but did so if at the same time they drank coffea or tea, for instance. It was mainly soft-boiled eggs that were not tolerated; hard-boiled or fried were better. Many patients had noticed that they got postcibal symptoms from certain definite foods, e.g. meat soup, crayfish, smoked herring, rose-hip soup, oranges,

apples, chocolate—even in small quantities. Very small amounts were reported to produce symptoms in many cases, e.g. a couple of slices of boiled egg, a piece of cucumber, or of cheese. Cheese was not tolerated in some cases where there was marked intolerance for milk.

93 % of all patients with postcibal symptoms of grades pc 1—3 noticed that one or more foods had a particular tendency to bring on postcibal symptoms. The patients belonging to grade pc 0 included 30 % who did occasionally experience very slight discomfort after eating certain common dishes (e.g. case 1) or somewhat more pronounced discomfort from special dishes (e.g. case 2).

Patients discovered in the course of time what they could eat without trouble. This was especially true of housewives who themselves prepared the meals.

Case 28. U 3933/48. Housewife, underwent B II (a. c. + e. a.) op. for duodenal ulcer at age of 45. Interviewed almost 3 years later. Ever since the op., after meals she had felt faint, warm, sticky about the body, her abdomen felt distended, she had unpleasant palpitations, and thought it difficult to breathe. She soon discovered that milk, eggs, and fruit soup were particularly troublesome, and had given up these foods. She had improved, and her symptoms were classed in *grade pc 1*. Weighed 3—4 kg more than her average preop. weight. She thought her symptoms were brought on by: milk, sour milk, cakes, pastries, fruit soup, boiled and fried eggs. She could eat without trouble: beef, pork cutlets, herring, pea soup, mashed turnips, boiled or fried bacon, potatoes and vegetables, coffee, tea, and light ale.

Similar descriptions of what agreed with them and what not were given by patient after patient, although the details of course differed. Foods commonly not well tolerated by ulcer patients—fatty, fried, and smoked foods—could often be eaten without trouble by gastrectomised patients. Some foods and dishes preferred by almost all patients were: crisp bread, butter, boiled and fried fish, salt herring, boiled and fried meat, boiled or raw vegetables, especially salads, boiled and fried potatoes. It was remarkable that crisp bread could be eaten, and in unlimited amounts, even by patients with postcibal symptoms of grade pc 3 (e.g. case 19, p. 50, who ate large quantities of crisp bread with sugar without the slightest discomfort).

Tolerance for coffee was usually good, as also for beer. Replacing milk with beer produced a pronounced improvement in many patients' postcibal symptoms. There were cases where beer—like all other liquids—had a deleterious effect, but its beneficial effects were often quite evident—a fact also pointed out by Hoffman (1939), Goffaerts *et al.* (1946), and Brun and Landelius (1947). Unflavoured spirits could usually be drunk without discomfort. About half the patients with postcibal symptoms who drank spirits more than merely occasionally said that a schnaps with meals generally prevented the occurrence of postcibal symptoms. Flavoured spirits, cognac, and liqueurs, on the other hand, often brought on symptoms.

Many patients noticed that spirits affected them much more quickly than before the operation, so that it felt as if the alcohol went straight to their heads.

Men patients included 13 % who said they were teetotallers, except for an occasional glass of beer (low alcohol content) or wine. The percentage of patients without postcibal symptoms in this group (65 in all) was 44.6 ± 6.2 %, as against 34.5 ± 2.3 % among the others (426 in all). The difference is not statistically probable (D: 10.1 ± 6.6 %); nor is it for grades pc 1—3.

Many patients had not ceased to be astonished about the way in which their tolerance for different kinds of food had been radically altered by the operation. After the operation they had no trouble with food generally regarded as hard to digest, e. g. sandwiches made with (Swedish) hard bread, fried herrings, fried or smoked meat, vegetables, whereas so-called light food such as milk, gruel, cream, soft-boiled eggs, fruit soups, etc. caused them most discomfort.

Discussion

It is shown that the more severe the postcibal symptoms the more often big meals, fluid meals and meals including milk or milk food provoke symptoms. 47 % of all partially gastrectomised patients did not tolerate milk and milk foods well.

What milk constituent may be the causative factor is not clear. Case *et al.* (1940) found that homogenised milk was tolerated better than non-homogenised by the jejunum of patients with jejunostomy. They thought this was probably due to the smaller size of the fat particles. The homogenising process used by them, including treatment with Tween 80 (polyoxyethylene sorbitan monooleate) not only affects the physical state of the fat constituent but certainly has a considerable effect on the protein material too. Pfisterer (1951) thought it might be the lactose, since sour milk, where only part of the lactose is intact, is better tolerated than milk. However, artificially curdled milk, where all the lactose remains unmodified, is also better tolerated.

It is generally agreed that the size of meals is an important food factor affecting postcibal symptoms, but that other factors cannot be disregarded.

Many authors mention that thin fluid foods, soups and drinks, are often not well tolerated by gastrectomised persons; Boller (1947), for instance, considered that all gastrectomised persons should avoid soups. However, it does seem that the consistency of meals has often been overshadowed by the size. Many doctors and gastrectomised persons seemed to be unaware of the fact that fluid foods and drinking with meals may often give rise to postcibal symptoms—to judge from experience gained during this investigation.

It has long been realised that milk and milk foods often cause gastrectomised persons postcibal distress—Luis-Yagüe y Espinosay (1921), Schur (1923), and others; see Table I. But some (e.g. Lublin (1941), Boller (1947)) considered that gastrectomised patients tolerated milk well as a rule, although there were exceptions. A few authors, such

as Irvine (1948) and Capper (1950) even found it "apparent that no particular foodstuffs could be blamed". Most manuals of surgery recommend milk foods after operation, and milk foods in fluid form are often given postoperatively in many hospitals.

Authors who have carefully questioned patients usually state that 40—50 % of them experienced discomfort after milk or milk foods, regardless of how long time had elapsed since the operation (Friedemann (1927, 1935), Hoffman (1939, 1952), Brun and Landelius (1947), Bernay and Blanchet (1950), Pfisterer (1951), and others). These figures accord with what I have found. As the above authors pointed out, the intolerance was often slight.

Despite the fact that gastrectomised patients have often been stated not to tolerate milk or milk foods, this investigation has shown that many doctors are unaware of this. Patients were quite often put on "ulcer diet" during convalescence after the operation, or when they consulted doctors about postcibal distress.

Intolerance for sweets (pastries, cakes, sweet soups) seems to be next most prevalent after that for milk and milk foods. Van Goidsenhoven *et al.* (1946) and Gaviser (1948), for instance, stated that nearly 20 % of patients have such intolerance, which accords with my results.

Intolerance for other specific foods has been mentioned by some authors, but little attention has been paid to it in general. The present investigation shows that eggs gave rise to postcibal symptoms in 11 % of all cases. There was also specific intolerance for a wide variety of other foods.

In some cases, it was evident that small quantities of particular foods gave rise to pronounced postcibal symptoms. This has been stressed by Boller (1947), Adlersberg and Hammerschlag (1949), and Muir (1949), and has been attributed to allergy (cf. p. 16).

I am of the opinion that of the various food factors affecting postcibal symptoms, the kind of food and its consistency is usually more important than the amount. There were many patients who reported that they could without difficulty eat relatively large meals of solid food which did not include things they commonly reacted to. A considerably smaller meal might give rise to postcibal symptoms if it included fluid dishes or particular foods not tolerated by the patient.

Other factors

As already mentioned (p. 54), postcibal symptoms seldom arose if the patient ate lying down. This has been known for a long time, and has been utilised therapeutically by Perman (1947). The reason is taken to be that the food then accumulates in the gastric remnant, and passes relatively slowly into the small intestine. This has been demonstrated radiologically by, among others, Bruusgaard (1946) and Boller (1947).

It is also generally recognised that the symptoms are milder, or altogether avoided, if the patient lies down immediately after eating; this may explain why patients do not experience much distress when they are in hospital. Even slight bodily exertion could accentuate symptoms.

The risk of symptoms was particularly large if the patient was hungry and ate too quickly, or ate to much of some favourite dish. Symptoms arose more easily if the patient was tired, harrassed, or nervous. Patients quite often noticed that their symptoms became worse if they were mentally or physically "low", or if they had lost weight because of illness. Acute gastroenteritis was usually followed by persistent deterioration of symptoms. Some patients felt much better on holiday, and others had worse symptoms when the wheather was bad. However, it was only exceptionally that patients made such observations.

Bruusgaard (1946) observed that gastrectomised women often lost their postcibal symptoms during pregnancy. In the present investigation there were 7 women with postcibal symptoms of grades pc 1—2 who had been pregnant. 6 of them had been quite free of their symptoms during the final stages of pregnancy, while 1 was somewhat better. The postcibal symptoms returned immediately after delivery.

Some women stated that their symptoms were especially troublesome on the days prior to menstruation.

CHAPTER 6

Commencement and Long-Term Variation of Postcibal Symptoms

Commencement

A few patients experienced distress from the very first meals in hospital.

Case 29. K 1899/47. Worker in explosives factory, underwent B II (r. c.) op. for duodenal ulcer at age of 30. 5 days after the operation he ate, lying down, 1/2 plate of oatmeal gruel and a little unsweetened egg custard. After a couple of minutes his abdomen felt distended and seemed to have stopped still. He felt sick, and waves of heat flowed through his body at intervals of a couple of minutes, causing him to flush deeply each time. He sweated, had palpitations, and a slight abdominal ache. After about 15 mins. his abdomen began to move again and the symptoms rapidly disappeared. The distress recurred every time he had gruel, but he got no symptoms from a large meal of fish, mashed potatoes and fruit soup. The symptoms diminished during the first 2 months after op. and then remained about constant. At the time of interview, 1 year later, he became just a little sleepy, felt somewhat sick and tight in the abdomen after gruel and milk, which he therefore took but seldom. Was then included in *grade (pc)*. He had had postcibal symptoms of the same type but less marked even in the years before operation.

Most patients first experienced the symptoms when they had returned home and began to eat larger meals, or when after convalescence they recommenced work, needed to eat more, and had no opportunity to rest after meals. Some patients did not have definite postcibal symptoms until some years after the operation, a fact also pointed out by Pulvertaft (1952). In the "B I" and "B II" groups this occurred in 12 cases with commencement of symptoms 2—8 years after the operation, that is about 10 % of those who had no definite postcibal symptoms about half a year after the operation.

Case 30. U 778/42. Gardener, underwent B II (r. c. + e. a.) op. for duodenal ulcer at age of 49. Interviewed 8 years later. 4 years after the operation he began to suffer from increasing postcibal distress, and had gradually to decrease the size of his meals. At the time of interview he was sometimes sunk in apathy for 15—30 mins. after eating. He became hot about the body, his heart thudded, he felt slightly sick, and tight in his abdomen. Milk was especially troublesome. Weighed more than 10 kg. less than his average preop. weight. *Grade pc 1.*

Case 31. U 3553/42. Former peat worker, underwent B I op. for gastric ulcer

at age of 61. Interviewed 9 years later. The first 3 years after the op. he only became a little tired after eating. Then the postcibal distress increased, despite smaller meals. At the time of interview he had "irritation in his body" almost every day after meals. He became hot, sweaty, felt sick, and had to rest 1 hour. He experienced most discomfort if he ate "too much", or if he had milk, soups, fatty food or dishes made from some kind of meal. Weight the same as average preop. weight. *Grade pc 2.* He had had seasonal rhinitis since youth.

Long-term variation

As mentioned on p. 36, it was attempted to estimate the postcibal symptoms about $^1/_2$ year after operation, from the information obtained at the interviews. About 60 % seemed to have had postcibal symptoms then. At the time of interview, about 40 % had such symptoms, so that there had been considerable improvement for some patients.

Patients usually stated at the interviews that their symptoms improved during the first 1 or 2 years after the operation. It was not possible to obtain reliable figures about how many experienced such improvement, since the follow-up intervals varied so much from patient to patient. If only the "B I" and "B II" groups, where the follow-up interval was long (median 10 years), are taken into consideration, the following approximate figures are obtained. They refer of course to the patients' own estimations of the improvement or deterioration of their symptoms.

Of those who were estimated to have definite postcibal symptoms (grades pc 1—3) about $^1/_2$ year after op.,

about 40 % stated at the interview that their condition had remained in the main unchanged,

about 20 % that they had improved appreciably. Nonetheless, at the time of interview, their symptoms were still of grades pc 1—2,

about 40 % that they had improved greatly. The improvement had been so great that they were included in grades pc 0 or (pc) at the time of interview. The improvement was most rapid during the first year, but quite often continued during the second and third, or even later.

In the majority of cases the patient's condition improved mainly because he gradually found out how to adjust his eating habits, usually by giving up milk and milk foods, and not taking soups and other fluids with meals. To a rather lesser extent, the improvement was spontaneous or a matter of becoming habituated—tolerance for different foods increased, and the size of meals could be increased.

The investigation clearly shows (cf. also p. 37) that it is not only during the first years after partial gastrectomy that postcibal symptoms occur. In the majority of cases the symptoms continue for years,

and I have seen patients (not included in the main series) who have had undiminished postcibal symptoms up to 25 years after a partial gastrectomy. Many patients, however, learn to adjust their eating habits, and in this way avoid or alleviate the symptoms. But there are also some patients who do not experience postcibal symptoms until many years after the operation.

CHAPTER 7

Postcibal Symptoms Not Associated with Gastrectomy

Most people have experienced fullness, lassitude or fatigue after a large meal. The feeling is particularly liable to occur if one is tired before the meal, while some people feel ill if they eat too ravenously or if they eat certain dishes. The trouble is generally no more than slight or passing, of the kind included in grades pc 0 and (pc). Non-gastrectomised persons may even experience postcibal symptoms with general and vasomotor distress, as pointed out by e.g. Porges (1928), Weir (1929), Alvarez (1948, 1949), Ask-Upmark (1951).

I have not been able to find any account of the frequency of postcibal symptoms in non-gastrectomised subjects.

But in some follow-up investigations of gastrectomy, the same questionnaire as sent to partially gastrectomised patients was also sent to patients not gastrectomised. John *et al.* (1939) found 19 patients with digestive symptoms of more than mild degree among 100 fracture cases. Odelberg (1948) found 31 cases with slight symptoms of gastritis or colitis among 100 patients treated for accidents.

Observations on the Present Cases

154 persons were interviewed personally in the same way as the gastrectomised patients (the "Karlskoga control" and "peptic ulcer" groups). 179 patients of the "Uppsala control" group filled in questionnaires and some of them were later interviewed (cf. p. 25). The results are given in Table XVI.

The differences between the different groups of patients are insignificant. Thus, about 4 % of non-gastrectomised patients had definite postcibal symptoms. If occasional or slight symptoms (grade (pc)) are also taken into account, at least 10 % had postcibal symptoms.

The patients in the "peptic ulcer" group were asked if they had experienced postcibal symptoms in periods when their ulcer distress was only slight or absent.

The patients in the "Karlskoga" and "Uppsala 46" groups were asked if they could remember having had postcibal symptoms in the years prior to their operations. This information cannot be accepted without considerable reservations, of course, in view of the long interim between the operation and the interview, sometimes many years. 15 patients (4.2 %) had had postcibal symptoms of grade pc 1, and 19 patients (5.3 %) symptoms of grade (pc). At interview after the op., 25 had symptoms of grades pc 1—3, 6 of grade (pc), and 3 of grade pc 0.

Table XVI. *Distribution of postcibal symptoms among non-gastrectomised patients.*

Grade of postcibal symptoms	"Karlskoga control"		"Peptic ulcer"		"Uppsala control"	
	No.	%	No.	%	No.	%
pc 0	77	88.5	53	79.1	158	89.3
(pc)	7	8.0	11	16.4	14	7.9
pc 1—3	3	3.5	3	4.5	5	2.8
Total	87	100.0	67	100.0	177	100.0

The postcibal symptoms experienced by the patients who had not undergone a gastric operation were similar to those of partially gastrectomised patients.

Case 32. K 41/49. 35 year old man undergoing treatment for coxalgia. Always got diarrhoea 15—60 mins. after drinking milk on a fasting stomach, together with upward pressure on his chest. Sharp abdominal pain from cream. *Grade (pc).*

Case 33. U 868/48. 70 year old retired builders' carpenter, operated on for hernia. Had suffered from vasomotor rhinitis and migraine for about 50 years. He sometimes felt exhausted after eating—he felt incapable of the slightest exertion, and wished to lie down and rest. At the same time an ache in the forehead. The trouble might occur daily or with months in between, after large or small meals. *Grade (pc).*

Case 34. U 1060/47. 28 year old farmer, operated on for hernia, but otherwise healthy previously. He always became tired after meals, and particularly after dinner felt hot and sweaty. His abdomen felt very distended, even after moderate meals. The symptoms began about 5 mins. after meals, and he felt a need to rest; but they disappeared if he moved about. Otherwise, they persisted for 1—1 1/2 hours. The trouble disappeared now and then for considerable periods, especially when he had had ample rest and felt properly fit. *Grade pc 1.*

Case 35. U 142/47. 37 year old labourer, operated on for hernia. Since a few months after the operation he had become very tired about 15 mins. after meals, and sometimes felt ready to collapse. When the trouble was worst, he also had a slight headache and a heavy sensation in the head, as well as polyuria. All symptoms disappeared within 1/2 hour. He sometimes experienced trouble daily, sometimes with days between. *Grade pc 1.*

Discussion

The postcibal symptoms among non-gastrectomised persons seem to be identical with those of gastrectomised patients, but the incidence is much lower—about 4 % with definite symptoms. It is noteworthy that patients with peptic ulcer do not seem to have postcibal symptoms more often than other persons. This indicates that the ulcer disease does not in itself predispose to postcibal symptoms.

The cause of the postcibal symptoms in the above-mentioned cases is not known, but possibly some of the many chronic diseases which produce postcibal symptoms may account for them. Some of these conditions are briefly described below.

Gastritis. The symptoms in various types of gastritis may include pains, nausea and vomiting after meals, but usually not postcibal fatigue and vasomotor symptoms (cf. p. 17). The symptomatology of gastritis has been much disputed, and some authors claim that persons with gastroscopically diagnosed chronic gastritis do not as a rule have any special subjective symptoms (e.g. Ricketts *et al.* (1949), Brummer (1951)).

Achylia is sometimes accompanied by so-called gastrogenous diarrhoea, though this does not usually occur in connection with meals.

Enteritis without colitis was a syndrome suggested by Porges (1928), sometimes involving postcibal symptoms, with weakness, vasomotor symptoms, and a characteristic region of soreness to the left and below the navel. These symptoms have been regarded as appertaining to the small intestine (for refs., see Moltke (1950)). They sometimes occur in non-gastrectomised patients with achylia or rapid emptying of the stomach, but often (as in Moltke's cases) there is normochylia and the barium meal is emptied from the stomach in the normal way, though the passage through the small intestine is accelerated. Moltke pointed out that anatomic confirmation is lacking, and that the symptoms might very well be regarded as functional. (Cf. p. 15.)

The gastrocardiac syndrome, first described by Roemheld (1912), includes a feeling of pressure against the heart, precordial discomfort, and palpitations. The symptoms sometimes follow meals, but at other times they are not associated with meals. It is thought that mechanical factors, usually upward pressure of the gas-distended stomach or colon on the diaphragm, are the chief cause of the symptoms, but constitutional elements and visceral reflexes have also been mentioned (for references, see Salvesen (1939)).

Allergic reactions. It has been known for a long time that some persons have a definite reaction to particular foodstuffs—in some cases with a severe shock condition (for references, see Einhorn (1902), Hansen (1943), Urbach and Gottlieb (1946), and Andresen (1953)). Allergic reactions to foodstuffs will be discussed later.

It is also possible that some of the above conditions may occasionally be of importance for the postcibal symptoms of gastrectomised patients.

There are a number of other conditions producing vasomotor and other symptoms resembling the postcibal symptoms in gastrectomised patients, such as neurocirculatory asthenia, arterial-orthostatic anaemia, menopausal symptoms. But the symptoms are then unassociated with meals and therefore not difficult to distinguish from the postcibal symptoms.

Postcibal Symptoms among Patients Partially Gastrectomised for Other Reasons than Peptic Ulcer

Little has been written about cases of resection for gastric malignancy. Some authors consider that postcibal symptoms do not occur (Leibovitz (1947), Schechter and Necheles (1949)), or are uncommon (Muir (1949), and others) among such patients.

I have not made any systematic investigation of operated cases of cancer, but such patients were often interviewed when visiting hospital for check-up. The impression gained, was that postcibal symptoms were less common in these patients than in those gastrectomised for ulcer. However, some patients had definite postcibal symptoms of mild or moderate grade. The same applied to some patients with partial gastrectomy performed for polyposis and pyloric hypertrophy.

CHAPTER 8

Postcibal Symptoms and Allergy

As previously mentioned, it has earlier been surmised that there was some connection between postcibal symptoms and allergy. After a partial gastrectomy, the small intestine has to cope with food not properly prepared for it. The mucous membrane of the small intestine comes into contact with substances normally foreign to it, and it seems reasonable to expect possible allergic reactions to occur soon after eating.

It is known that small quantities of proteins consumed in physiological amounts are absorbed unmodified (for references, see Walzer (1927), Ratner and Gruehl (1934), Urbach and Gottlieb (1946)). The permeability of the mucous membrane in this respect is highest in children, but it is also significant in healthy adults, as shown, for instance, by Walzer's experiments with the initiation of Prausnitz-Küstner reactions by the peroral route. The quantities involved are so small that they are of no nutritional importance. But they may be of importance from the immunological point of view. Ratner and Gruehl (1934) thought this normal absorption might serve a useful purpose in maintaining a state of constant immunisation against protein ordinarily ingested. In certain circumstances, however, allergic sensitivity may occur—for instance, if the allergen is present in unusually high concentration, or if the intestinal mucous membrane has been damaged mechanically, toxically or by inflammation (Hansen (1943), Urbach and Gottlieb (1946)).

Increased absorption of unchanged or incompletely changed proteins does not always mean that an allergy with clinical symptoms appears. The tendency to allergic reaction varies from individual to individual. Some persons have an allergic tendency which is constitutional, to some extent hereditary. It is such persons who get what are called spontaneous allergic diseases—asthma, hay-fever, vasomotor rhinitis, urticaria, angioneurotic oedema, and eczema. Typical migraine and certain gastrointestinal complaints are sometimes included among the allergic diseases.

The usual figure quoted for the incidence of allergic diseases is about 10% of the population. The figure varies, because different diseases are included (for references, see Kaijser (1946) and Vaughan and Black (1948)).

In order to ascertain whether symptoms caused by particular foods might be allergic in origin, use may be made of certain anamnestic and diagnostic measures, including,

a. recording of personal history of allergy
b. skin tests
c. investigation of the therapeutic effect of epinephrine.

The following points will be considered:

1. The incidence of postcibal symptoms among patients (both gastrectomised and not) with allergic conditions and among those without.
2. The results of intracutaneous skin tests.
3. The effectiveness of epinephrine on postcibal symptoms.

No Prausnitz-Küstner tests were carried out, mainly in view of the risk of inoculation with hepatitis virus.

Postcibal Symptoms in Patients With and Without Allergy

The patients have been divided up into the following "allergy" groups:

"All+"—"allergics", persons with allergic diseases, i.e. asthma, seasonal rhinitis, recurrent urticaria or angioneurotic oedema, chronic eczema.

"All?"—"suspected allergics", persons with symptoms suspected to be allergic, e.g. isolated attacks of urticaria, migraine, some chronic bronchitis.

"All—"—"non-allergics", persons without allergy.

The diseases included in "all+" have usually been accepted as allergic, even if they sometimes have other causes. By far the greater part of isolated attacks of urticaria are probably of allergic origin, but they have not been counted as allergic complaints. Eczema of the type neurodermatitis disseminata (Besnier) and chronic or recurrent eczema associated with allergy have been included in the group "all+". Migraine is sometimes attributed to allergic causes, but it is difficult to establish in individual cases whether it is so from the history. Migraine has therefore been included under "all?". Chronic bronchitis of asthmatic type, rhinnorrhoea—other than when exposed to severe cold or wind or irritating substances in the air—, persistent repeated bouts of sneezing, etc., are probably of allergic origin, and have been included in the group "all?".

Since we are here dealing with the possible dependence of certain gastrointestinal conditions on allergy, persons with gastrointestinal symptoms but otherwise without symptoms belonging to the groups "all+" or "all?" have been included in the group "all—".

The incidence of allergy in the different groups of patients is given in Table XVII.

Of the patients in the "Karlskoga" and "Uppsala 46" groups who were interviewed personally, about 8 % belong to the "all+" group before operating. The figures for the control groups do not differ substantially.

The low figure for "all?" in the "Uppsala control" group is presumably due to the fact that the material was mostly derived from questionnaires.

The considerable lapse of time between the operations and interviews made it difficult to assess allergic conditions among the patients in the "B I" and "B II" materials (255 cases). 5.9 % (15 cases) belong to the group "all +" and 12.9 % (33 cases) to "all?".

Table XVII. *Incidence of allergy. Percentage figures.*

Group of allergy	Preoperative allergy in gastrectomised persons		Allergy in the control groups		
	"Karlskoga" (155 cases)	"Uppsala 46" (204)	"Karlskoga control" (87)	"Peptic ulcer" (67)	"Uppsala control" (177)
all−	71.6	77.0	67.8	70.2	87.0
all?	20.0	15.2	23.0	16.4	5.1
all+	8.4	7.8	9.2	13.4	7.9
Total	100.0	100.0	100.0	100.0	100.0

Table XVIII. *Incidence of allergy in men and women. Percentage figures.*

Group of allergy	Preop. allergy in gastrectomised patients		Control groups			
	"Karlskoga" and "Uppsala 46"		"Karlskoga control"		"Uppsala control"	
	♂ (301 cases)	♀ (58)	♂ (67)	♀ (20)	♂ (153)	♀ (24)
all−	77.7	58.6	68.6	65.0	88.3	79.1
all?	15.3	27.6	22.4	25.0	5.2	4.2
all+	7.0	13.8	9.0	10.0	6.5	16.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

The women in the "Karlskoga" and the "Uppsala 46" materials belong to the "all+" and "all?" groups more often than men (Table XVIII).

The difference between the percentages of men and women belonging to the combined allergy groups is statistically probable (Difference: 19.1 ± 6.9 %. The respective percentages are 22.3 ± 2.4 % and 41.4 ± 6.5 %).

In the control groups the distribution between the sexes is more even.

Partially gastrectomised patients

The grade of postcibal symptoms for the patients in different allergy groups is given in Table XIX.

There is a considerably higher percentage of patients with definite postcibal symptoms in the "all?" group, and more so in the "all+" group, than in the "all—" group.

The difference between the percentages of patients without postcibal symptoms (pc 0) in the groups "all—" and "all+" is statistically significant (Difference: 35.7 ± 4.6 %), as well as the difference be-

Table XIX. *Distribution of postcibal symptoms among gastrectomised patients with preoperative allergy and without. "Karlskoga" and "Uppsala 46" groups.*

Grade of postcibal symptoms	all−		all?		all+	
	No.	%	No.	%	No.	%
pc 0	105	39.2 ± 3.0	9	14.5 ± 4.5	1	3.5 ± 3.5
(pc)	74	27.6 ± 2.7	17	27.4 ± 5.7	5	17.2 ± 7.1
pc 1	65	24.2 ± 2.6	23	37.1 ± 6.1	12	41.4 ± 9.3
pc 2	20	7.5 ± 1.6	10	16.1 ± 4.7	8	27.6 ± 8.4
pc 3	4	1.5 ± 0.7	3	4.9 ± 2.7	3	10.3 ± 5.7
Total	268	100.0	62	100.0	29	100.0

tween the percentages of patients with definite postcibal symptoms (grade pc 1—3) (Difference: 46.1 ± 8.2 %. The respective percentages for grades pc 1—3 are 33.2 ± 2.9 % and 79.3 ± 7.7 %).

There are also statistically significant differences between the "all—" and "all?" groups (D for grade pc 0: 24.7 ± 5.4 %; D for grades pc 1—3: 24.9 ± 6.9 %. The respective percentages for pc 1—3 are 33.2 ± 2.9 % and 58.1 ± 6.3 %).

These calculations have been made without taking into account factors which previous results showed might affect the occurrence of postcibal symptoms, viz., sex, age, type of operation, and the follow-up interval.

The age distribution and the follow-up intervals do not differ greatly for the combined allergic group as compared with the non-allergic group. But women, on the other hand, are over-represented in the allergic groups (26.4 ± 4.6 % women in the combined allergic group and 12.7 ± 2.0 % in the non-allergic group).

The most uniform material was therefore selected for a comparison —men who had undergone the B II operation with retrocolic anastomosis (Table XX). Here also, there are more patients with postcibal symptoms in the "all+" and "all?" groups than in the "all—" group. The differences between the non-allergic group and the combined allergy group as regards the percentages of patients without postcibal symptoms are statistically significant (Difference: 27.8 ± 5.4 %). The same applies to grades pc 1—3 (Difference: 27.3 ± 7.9 %).

Comparison of the "all—" and "all+" groups gives a significant difference for grade pc 0 (D: 30.5 ± 6.5 %), as well as for grades pc 1—3 (D: 41.0 ± 11.0 %).

The results in the "B I" and "B II" groups are similar to those above. There were 15 patients in the "all +" group and 33 in the "all?" group. 2 (13.3 ± 9.1 %) of the former belong to grade pc 0 and 6 (18.2 ± 6.8 %) of the latter. The differences between the non-allergic group and the combined allergy group are statistically significant for grade pc 0 (D: 20.0 ± 6.4 %. The respective percentages are 36.7 ± 3.4 % and 16.7 ± 5.4 %) and for grades pc 1—3 (D: 27.4 ± 7.7 %. The respective percentages are 37.2 ± 3.4 % and 64.6 ± 7.0 %).

Table XX. *Distribution of postcibal symptoms among B II cases with preoperative allergy and without. Only men with retrocolic anastomosis included. Reoperated cases omitted.*

Grade of postcibal symptoms	"Karlskoga"		"Uppsala 46"		The groups added together					
	all −	all $\overset{+}{?}$	all −	all $\overset{+}{?}$	all −		all $\overset{+}{?}$		all +	
	No.	No.	No.	No.	No.	%	No.	%	No.	%
pc 0 . .	29	2	28	2	57	35.8±3.8	4	8.0±3.9	1	5.3± 5.3
(pc) . .	22	8	28	8	50	31.5±3.7	16	32.0±6.6	4	21.0± 9.6
pc 1—3 .	27	15	25	15	52	32.7±3.7	30	60.0±6.9	14	73.7±10.4
Total	78	25	81	25	159	100.0	50	100.0	19	100.0

Women belonging to the "all+" group all had definite postcibal symptoms, usually of grades pc 2—3. Among the men in the "all+" group, a few had no postcibal symptoms, the others usually mild ones.

Among the patients with definite allergy preoperatively the numbers with different grades of postcibal symptoms were:

30 men: pc 0—3, (pc)—7, pc 1—14, pc 2—5, pc 3—1.
14 women: pc 1—5, pc 2—5, pc 3—4.

These patients' partial gastrectomies did not as a rule produce any marked change in their allergic symptoms; although they had disappeared in a few cases, in others became worse, while new allergic symptoms had appeared in yet other cases.

Since the small intestine provides an entrance for allergens into the system, allergic symptoms might be expected to appear somewhat more often after a partial gastrectomy. Boller (1047) pointed out that urticaria and eczema are not uncommon among gastrectomised patients. Of the 475 patients in the present investigation who belonged to the "all—" group before operation, 14 (2.9 %) had "all+" symptoms, and 34 (7.2 %) "all?" symptoms after operation. 2 of the former had no postcibal symptoms, 2 symptoms of grade (pc), and 10 symptoms of grades pc 1—3. 12 of the latter had no postcibal symptoms, 10 symptoms of grade (pc), and 11 of grades pc 1—2. 4 patients with "all?" symptoms before operation had "all+" symptoms after operation.

The symptoms in a few of the cases were obviously due to allergens not associated with food, but it seems probable that partial gastrectomy does involve a certain risk—though a small one—that allergic symptoms will afterwards appear.

Non-gastrectomised patients

The asthmatic patients were selected in order to get a homogeneous group of persons very likely to be allergic (but not especially for foodstuffs). Of the 48 cases, 11 (22.9 ± 6.1 %) had postcibal symptoms of grades pc 1—3 and equally many symptoms of grade (pc).

(People experience discomfort from eating during bouts of asthma. This has been disregarded in assessing postcibal symptoms.)

Examples of asthmatics with postcibal symptoms:

Case 36. U Med[1] 815/47. Builder, 64 years old, who had for 10 years suffered from attacks of asthma on coming into contact with down, feathers, fur, etc. He was usually a little distended in his abdomen and a little tired about 10 mins. after meals. Occasionally brought up a little food, and might sometimes have to spit out a little while after eating. *Grade (pc).*

Case 37. U Med 484/47. Salesman, 50 years old, who had suffered from asthma since he was 10—chronic in recent years. He had had eczema on his hands. His abdomen always felt bloated after eating meat or onions. Tired after meals in more recent years, so that he sometimes liked to lie down. *Grade (pc).*

Case 38. U Med 2019/48. Factory worker, 34 years old, who from childhood had had asthma, vasomotor rhinitis, eczema, and urticaria. The asthma became worse 7 years before the interview. From that time on he noticed that his abdomen felt tightly full about an hour after eating pancakes, eggs, rose-hip purée, or peas; he felt nervous and hot, and his cheeks burned. His food came up again, breathing became more difficult, sometimes slight asthma came on, and a little watery liquid dropped from his nose. The distress disappeared in 1/2—1 hr. He did not experience this after eating food other than that mentioned. *Grade pc 1.*

Case 39. U Med 479/47. Laundress, 51 years old, who had had asthma and vasomotor rhinitis since she was 46. The asthma later occurred only occasionally. Discomfort after meals started at about the same time as the asthma. Roughly 1/2 hr. after meals she became tired and weak, warm and sticky about the body, damp on her forehead, and a little giddy. Her head felt heavy, she felt as if she could hardly breathe and scarcely stand up, so that she sometimes had to lie down. All distress disappeared after about 1 hr. She experienced this trouble after all large meals—she could eat much more without discomfort before her asthma. She had not noticed any connection with particular foods. *Grade pc 2.*

Case 40. U Med 2392/47. Housewife, 53 years old, who had had vasomotor rhinitis, eczema, urticaria, angioneurotic oedema, and, for the past 12 years, occasional attacks of chronic asthma. She had experienced discomfort after meals as long as she could remember. Towards the end of meals, or a few mins. after, her abdomen began to swell, it felt heavy, she felt hot all over her body, warm and red in the face: her children used to say, "Now Mummy's getting red again". She became tired, felt a little sick, had to work in order to breathe, and experienced a feeling of anxiety. When the symptoms were severest, there was a tightness in her head, and her heart beat heavily. She had to rest after meals almost every day. The distress disappeared after 5—15 mins., but the tiredness remained for as much as 1 hr. She thought that milk and milk dishes were particularly troublesome; but that varied considerably. The prodromes of an asthma attack were similar to the postcibal distress, and this distress sometimes passed directly into an attack of asthma. *Grade pc 3.*

Case 41. U Med 1232/47. Housewife, 50 years old. Had had allergic symptoms since she was a child, and asthma for the past 12 years. For about 7 years she had suffered from postcibal symptoms like those of Case 40. She got these symptoms even after eating a couple of pieces of chocolate or after drinking cocoa or milk. The prodromes of an asthma attack resembled the postcibal distress. *Grade pc 3.*

The "Uppsala control" group—described on p. 72—includes 5 cases with asthma (3 of grade pc 0, 1 (pc), 1 pc 1). If these cases are trans-

[1] U Med = Medical Clinic, Academic Hospital, Uppsala.

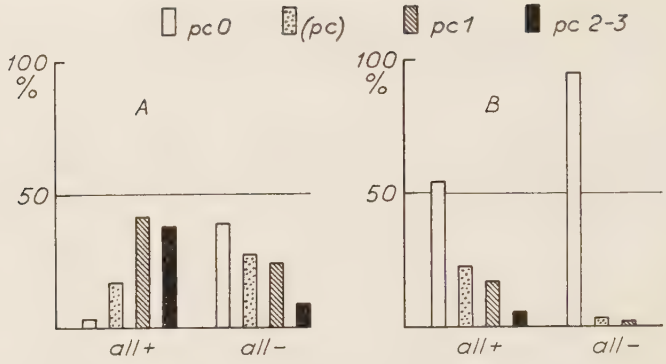


Fig. 4. Different grades of postcibal symptoms among patients with allergy and those without.

A. Partially gastrectomised patients (preoperativ allergy) — cf. Table XIX.
B. Non-gastrectomised persons (all + = asthma cases) — cf. Table XXI.

Table XXI. *Distribution of postcibal symptoms among non-gastrectomised persons with allergy and without.*

Grade of postcibal symptoms	All +		All −	
	No.	%	No.	%
pc 0	29	54.7 ± 6.8	146	94.8 ± 1.8
(pc)	12	22.7 ± 5.8	5	3.2 ± 1.4
pc 1	9	17.0	3	2.0 ± 1.1
pc 2—3 . .	3	5.6 } 22.6 ± 5.7	—	—
Total	53	100.0	154	100.0

ferred to the asthma group and other cases in the "all+" and "all?" groups disregarded, 154 patients entirely without allergy remain. The distribution of postcibal symptoms is shown in Table XXI.

As among the partially gastrectomised patients postcibal symptoms are here considerably more common among allergics than among non-allergics.

The difference between the percentages of patients without postcibal symptoms in the asthma and non-allergic groups respectively is statistically significant (Difference: 40.1 ± 7.1 %). The corresponding difference for postcibal symptoms of grades pc 1—3 is also statistically significant (Difference: 20.6 ± 5.9 %).

Even if only the 5 cases with asthma are omitted from the "Uppsala control" group, the difference between the remaining group and the asthmatics is still

statistically significant. 4 of the 9 remaining "all+" cases had postcibal symptoms of grade (pc), and of the 9 "all?" cases 1 had grade pc 1 and 4 grade (pc).

Of the 30 men among the 53 asthma cases, 5 had grade pc 1 symptoms and 6 grade (pc); of the 23 women, 7 had grades pc 1—3 and 6 grade (pc).

Of the 34 patients in the "Karlskoga" and "Uppsala 46" groups who could remember having postcibal symptoms prior to the operation, 19 belonged preoperatively to the "all—" group, 9 to the "all?" group, and 6 to the "all +" group.

The more important results of this section are presented graphically in Fig. 4. The investigation shows that patients who suffered, or were suspected of suffering, from allergic conditions before the partial gastrectomy had postcibal symptoms after the operation in a greater proportion of cases and in severer grades than persons who did not show preoperative signs of allergy. It is also shown that among patients not operated on, those with allergy (asthma) had postcibal symptoms more frequently and more severely than those who had no manifest allergy.

Results of Intracutaneous Skin Tests

It is possible to estimate a subject's tendency to react allergically by means of some form of skin test. The results of such tests must be interpreted with caution. A positive reaction does not necessarily imply clinical sensitivity ("latent allergy", Salén and Juhlin-Dannfeldt, (1935), and others). Nor does a negative reaction signify that a specific antibody is lacking elsewhere than in the skin (Hansen (1943), Urbach and Gottlieb (1946), Kaijser (1946), Cooke (1947), and others).

As regards allergic reactions to foodstuffs, it is generally agreed that skin tests are not very reliable. There is quite often no reaction, even when food allergy is clinically certain. The customary explanation advanced for this is that the sensitivity may be for break-down products of the ingested food. The specificity of the antigen may be changed by digestion, which accounts for a possible negative reaction to a skin test with the allergen in natural form. Some writers—Rinkel *et al.* (1951) and Andresen (1953), for instance—consider skin tests useless for the diagnosis of food allergy.

However, Berger (1928) and Salén *et al.* (1938) showed that allergic subjects (asthmatics) reacted positively to intracutaneous tests more often than non-allergic subjects. Kaijser (1946) showed that the same applied even if only food extracts were used. I therefore considered it justifiable to investigate by intracutaneous skin tests with food extracts whether there was any difference in the proportion of positive skin reactions among patients with postcibal symptoms and among those without.

Method. 17 different food extracts were used (vegetables, wheat, rye, barley, oats, maize, orange, chocolate, hazel nut, fish, meat, boiled milk, raw milk, boiled egg-yolk, uncooked egg-white, boiled egg-white, lobster). The extracts were

prepared by Dr Olof Wilander, Örebro, using Coca's method, and have long been used for clinical skin tests. The extracts were kept in a refrigerator and renewed every 3—5 months. 0.1 ml. of each extract was injected intracutaneously in the upper part of the back. The same quantity of solvent (Coca's) and of histamine in a concentration of 1 : 10000 was injected for comparison. A separate syringe was used for each extract. The concentration of the extracts was 1 : 1000.

The result was assessed after 10—15 mins. The check with Coca's solution (which must give no reaction for the test to be acceptable) was denoted by 0, and the histamine reaction by +++. Other reactions were graded accordingly; the minimum requirements were:

\+ = no or slight enlargement of the wheal, 15—20 mm diam. definite redness.
++ = definite enlargement of the wheal, about 1/2 as much as with the histamine wheal. Redness corresponding.
+++ = reaction equal to or stronger than the histamine reaction.

The results of the analysis in each case has been included in one of the following arbitrarily selected groups:

1) no reaction.
2) 1—2 + reactions.
3) 1 ++ reaction or 3 + reactions.
4) 1 +++ reaction or 3 ++ reactions.

A check was made on the extracts and method used, to see whether they were suitable for a determination of the degree of sensitivity in a group of patients. The subjects were non-gastrectomised patients with or without allergy. The investigation showed that the method was suitable.

In all, 172 patients were examined. They included the greater part of the "Karlskoga control" and "peptic ulcer" groups, together with 21 other selected patients (14 "all+" and 7 "all—"). 25.8 ± 3.6 % of the non-selected patients gave at least one positive reaction. The test results are given in Fig. 5 A.

The difference between the percentages of patients in groups "all—" and "all+" with at least one + reaction is 40.8 ± 9.7 %. (The respective percentages are 17.3 ± 3.6 % and 58.1 ± 9.0 %.) The difference with at least one ++ reaction or 3 + reactions is 41.1 ± 9.5 %. (The respective percentages are 7.3 ± 2.5 % and 48.4 ± 9.1 %.) The differences are statistically significant.

The differences are still significant if the "all+" and "all?" groups are combined and compared with the "all—" group.

Among the patients who had had partial gastrectomy, 273 of the "Karlskoga" and "Uppsala 46" groups were skin-tested after the operation. 29.7 ± 2.8 % of these had at least one positive reaction. Fig. 5 B shows the results of skin tests in different allergy groups. Persons belonging to groups "all+" and "all?" reacted positively more often than those without preoperative allergy, but the difference is not statistically probable.

The difference between the percentages of "all—" and "all+" with at least one positive skin reaction is 20.9 ± 11.1 %. (The respective percentages are 26.9 ± 3.1 % and 47.8 ± 10.6 %.)

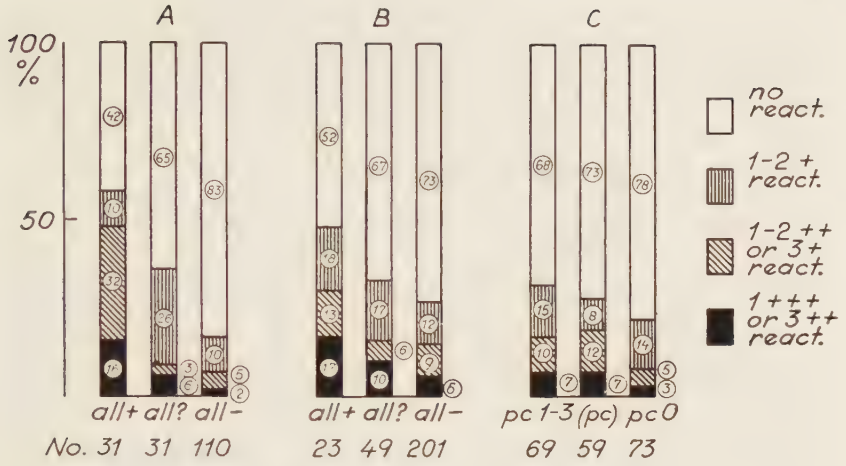


Fig. 5. Results of skin tests. The inset figures are percentages. The figures under the colums denote the number of patients in each group.

A. Non-gastrectomised persons in different allergy groups.
B. Partially gastrectomised patients in different preoperative allergy groups.
C. Partially gastrectomised patients without allergy, with different grades of postcibal symptoms.

In order to eliminate the effect which preoperative allergy may quite well have, only patients free from preoperative allergy are included in the comparison between groups with postcibal symptoms and without. See Fig. 5 C. Although the figure suggests that the proportion of positive test reactions increases with the severity of postcibal symptoms, there is no statistically probable difference.

The difference between the percentages of patients with at least one + reaction in the group without postcibal symptoms and that with definite symptoms (grades pc 1—3) is 10.0 ± 7.4 %. (The respective percentages are 21.9 ± 4.8 % and 31.9 ± 5.6 %.) The corresponding difference for at least one ++ reaction or three + reactions is 9.2 ± 5.6 %. (The respective percentages are 8.2 ± 3.2 % and 17.4 ± 4.6 %.)

Some of the gastrectomised patients had one or more positive skin reactions to foods that usually gave rise to postcibal symptoms.

Of 13 milk-positive patients (4.8 % of all skin-tested patients) 6 did not tolerate milk or milk foods (case 19) while 7 did. This is what might have been expected, as 47 % of the whole patient material reported that milk or milk foods did not agree with them (cf. p. 58.)

Of 9 egg-positive patients (3.3 %), 3 did not tolerate eggs (case 7),
of 9 meat-positive (3.3 %), 2 did not tolerate meat (case 2),
of 16 chocolate-positive (5.9 %), 2 did not tolerate chocolate (case 21), and
of 43 lobster-positive (15.8 %), 2 did not tolerate lobster or crayfish.

Intolerance to different sorts of flour is difficult to assess, since most farinaceous dishes usually include several other foods, particularly milk. 34 patients (12.5 %) reacted positively to one more kinds of grain. 17 of these said they did not tolerate gruels or porridge (case 13). There were several who had found that gruel made with milk was not tolerated, while the same sort of gruel made with water gave no trouble.

Among the controls (151 "Karlskoga control" and "peptic ulcer" patients)
5 (3.3 %) were milk-positive,
11 (7.3 %) were egg-positive. Egg had given one of them urticaria,
6 (4.0 %) were meat-positive,
10 (6.6 %) were chocolate-positive,
19 (12.6 %) were lobster-positive. Crayfish had given one of them urticaria;
15 (9.9 %) reacted positively to one or more kinds of grain. One patient felt ill and his abdomen became distended with wind after eating fresh bread, even in small quantities.

Apart from the 3 patients just mentioned there was none who had observed subjective symptoms for foods for which they had positive skin reactions.

2 patients reacted to tests in a particularly interesting manner, and their cases are therefore mentioned in greater detail:

Case 42. K 850/43. Transport worker, underwent B I operation for duodenal ulcer at age of 31. Interviewed 5 years later.

Since the operation he had felt sick and faint about 5—10 mins. after eating —he also felt hot, his heart palpitated, and his head ached. The food came up, his abdomen felt distended, and gurgled. He often put his fingers down his throat so that he could vomit. The distress lasted about 30 mins. Radiological examination 1 year earlier had shown no signs of stenosis. Weighed 4 kg less than his average preop. weight. *Grade pc 2.*

There was no positive reaction to skin tests. However, he felt faint and queer 5 mins. after testing, he got palpitations and headache, his abdomen felt tight, and he needed to rest. The discomfort lessened after 5 mins., and after 15 mins. had disappeared. He several times said surprisedly that it felt just like after eating.

Case 43. K 1004/45. Tool-maker, underwent B II operation for duodenal ulcer at 35 years of age. Interviewed 3 years later.

Since the operation, postcibal symptoms of *grade pc 3.* He felt faint 5—10 mins. after meals, hot (had several times taken his temperature as he thought he had fever), and sometimes sweated so much that he had to change his undervest after meals. He felt giddy, his heart thudded rapidly, his face might flush, sometimes his eyes became red and smarted, and on several occasions he had urticaria together with the other symptoms. The distress lasted 1—1 1/2 hrs., and sometimes ended with diarrhoea. Milk dishes and fruit-soup were most troublesome. Weight the same as average preop. weight.

On skin testing, he reacted ++ to orange, boiled egg-yolk and uncooked white-of-egg, and + to vegetables, wheat and oats. 15 mins. after the injections he flushed up, his eyes became red and smarted, he felt faint, his heart palpitated, and he thought it felt like after meals. After treatment with epinephrine and calcium gluconate the symptoms slowly disappeared within 1/2 hr.

Thus in these two cases the intracutaneous skin tests provoked symptoms which strongly resembled the postcibal symptoms from which the patients suffered.

The Effect of Epinephrine on the Postcibal Symptoms

Epinephrine— 0.2—0.5 ml 1:1 000 solution subcutaneously—is frequently very valuable for the temporary relief of acute allergic symptoms, though it is not always effective.

0.2—0.3 ml epinephrine was injected in 8 cases after postcibal symptoms had been provoked by ingestion of milk or gruel. It is difficult to judge the effectiveness of measures taken while the postcibal symptoms are present, since the symptoms in any case disappear spontaneously after a short time. In addition, the patients showed reactions to the epinephrine—e.g. feeling of tremors—which made it yet more difficult to assess the effect of the injection on the postcibal symptoms. Nevertheless, the epinephrine had a marked effect on 4 patients who had obvious postcibal symptoms. The symptoms vanished in a manner which astonished the patients. The postcibal symptoms were slight in the other 4 cases; the epinephrine had a moderate effect in 2 of these, and none at all in 2 other.

Case 44. U 403/39. Foreman, underwent B II operation at age of 44 for duodenal ulcer. Interwiewed 13 years later. Since the operation he had had strong postcibal symptoms after milk dishes and soups containing potato flour. Usually avoided such food, and then experienced no or only slight symptoms. A barium meal with milk gruel was given for radiological examination. After about 13 mins. he had a nervous, uneasy feeling in his abdomen and upward pressure in his chest. He later became tired, and after 21 mins. felt faint, feverish and heavy-headed. He sat huddled up, looked extremely tired, and appeared exhausted. 0.3 ml epinephrine was injected subcutaneously after 31 mins. 5 mins. later he felt better, but felt tremors in his hands and legs. 7 mins. after the injection he was quite restored and clear-headed—the sensation of warmth had disappeared, and the nervous discomfort in his abdomen too. He said of his own accord that the symptoms had never disappeared so quickly before; usually they persisted for 2—3 hrs., and then did not go before he had lain down and rested.

Case 19 (p. 50) and *case 25* (p. 53). Epinephrine given while the postcibal symptoms were developing after the drinking of milk produced an almost immediate complete restoration, as in the above case.

Discussion and Conclusions

There is no point in discussing whether a symptom or group of symptoms may be ascribed to food allergy until a definite cause-and-effect relationship between ingestion of a particular food and subsequent symptoms has been established. It must be shown that the ingestion of foods containing the assumed antigen is regularly followed by specific symptoms, and that these symptoms fail to appear after elimination of the suspected food. Support is obtained for the diagnosis of allergy if sensitisation is observed in the local wheal reaction to a skin test (see, e.g., Cooke (1947)). The symptoms in question are more likely to be of an allergic nature if the patient has a definite allergy, or if concurrent (or alternating) manifestations of allergy, rhinopathy, or migraine are

present. The same applies if epinephrine has a therapeutical effect (Hansen (1943), Urbach and Gottlieb (1946), and others).

The results of the present investigation will be considered in the light of the above to see whether they indicate any connection between allergy and postcibal symptoms.

Cause-and-effect relationship. The majority of the patients with postcibal symptoms thought that certain foods—especially milk and milk foods—were particularly liable to give rise to their symptoms. Many patients stated that even small amounts of certain foods (milk, eggs, cheese, apples, chocolate, etc.) brought on postcibal symptoms. There thus seemed to be a cause-and-effect relationship between certain foods and postcibal symptoms in most cases.

Provocation and elimination. Many patients had of their own accord made provocation tests over several years, and had convinced themselves that the supposed food intolerance still existed. They had also found that the elimination of certain foods relieved them of postcibal distress.

In some cases food intolerance was verified by provocation tests at the hospital. It may be objected that the patients knew what they were eating on such occasions, and that the effect may have been entirely psychogenic. However, patients who experienced postcibal symptoms in connection with radiological examination did not know that the contrast meal contained certain foods (see p. 87).

The postcibal symptoms in gastrectomised patients might sometimes fail to appear if the suspect food which usually provoked symptoms was taken in small quantities or under special conditions (cf. pp. 58 and 61). This does not exclude the possibility of food allergy, as it is well known that sensitiveness to food in many patients is a quantitative problem (cf. Hansen (1943), Urbach and Gottlieb (1946)), and that the intolerance may be affected by physical and psychic factors (e.g. Kaufmann (1952)).

The elimination of one or more foods did not always ensure that the postcibal symptoms disappeared. Large meals, or meals including fluid dishes, or drinking with meals, could also give rise to distress, even though no suspected foods were taken. In a few cases, large amounts of plain water produced postcibal symptoms. In such cases there is no reason to suspect an allergic reaction mechanism. The same applies to the observation that postcibal symptoms may be provoked by intrajejunal instillation of concentrated glucose and salt solutions (Machella (1949, 1950), Glazebrook and Welbourn (1952)) (cf. p. 15). In these cases the reaction mechanism must be of another kind.

Skin tests. The results of skin tests did not provide evidence of an allergic origin for postcibal symptoms. Non-gastrectomised persons with spontaneous allergy reacted positively to skin tests more often

than non-allergic ones. It would have been good evidence that postcibal symptoms may depend on allergy if gastrectomised patients with postcibal symptoms and without preoperative allergy had more often reacted positively than those without symptoms. Such was not found to be the case, but this does not imply that the symptoms could not be due to allergy. For reasons already mentioned (p. 77), there is general agreement that skin tests are of little value in determining allergic sensitivity to food. Moreover, it seems likely that if postcibal symptoms are of allergic origin, they do not correspond to a spontaneous allergy but to an allergic reaction to artificially induced protein sensitisation. Walzer (1947) writes that, "while atopic patients are inclined to produce reagins for common foods and inhalant allergens, many of which have relatively weak antigenic properties, the non-atopic person usually lacks this tendency". Consequently, it is not necessary to expect that non-allergic persons with postcibal symptoms should more often react positively to skin tests than non-allergic persons without them, even if the symptoms are connected with allergy.

Some patients gave positive skin reactions to foods which they considered to cause their postcibal symptoms. Coincidence of these two circumstances may be regarded as support for the idea that these patients' postcibal symptoms after ingestion of the foodstuff concerned were due to food allergy.

Spontaneous allergy in persons with postcibal symptoms. It was found that postcibal symptoms were more frequent and more severe among allergics, both gastrectomised and not, than among non-allergics.

On coming into contact with antigens of various kinds, allergics react allergically more often than do non-allergics (Hansen (1943), Urbach and Gottlieb (1946), Cooke (1947)). Since allergics more often react with symptoms after meals than do non-allergics it is not inconceivable that an allergic mechanism is involved in the production of these symptoms. If true, this is more likely to apply to allergics, but possibly to non-allergics as well.

However, it is necessary to make a reservation at this point: the autonomic nervous system is usually more sensitive in allergics than in non-allergics, and the fact that allergics more frequently suffer from postcibal symptoms may be due to greater vulnerability and reactive tendency in their gastro-intestinal tract, without any allergic reaction being involved.

Concurrent allergic manifestations. Some patients occasionally had urticaria, vasomotor rhinitis, rhinorrhoea, irritation of the eyes, and localised itching, concurrently with other postcibal symptoms. These symptoms are commonly regarded as allergic if they recur repeatedly after ingestion of certain foodstuffs. When they concur with other postcibal symptoms, the latter need not be of allergic origin, of course, but there is a suggestion that they may be.

Effect of epinephrine. The injection of epinephrine in a few cases dispelled postcibal symptoms already present, which suggests that the symptoms on these occassions might have been of allergic origin.

Also relevant in this connection are the two cases where *postcibal symptoms occurred after intracutaneous injection of food extracts.* It may be that the food extracts gave rise to allergic reactions after absorption. However, the cases were few, and no control tests were carried out on these patients.

The question put forward on p. 21 ("Is there any evidence that allergic factors may be associated with postcibal symptoms?") may be answered as follows. *There is a correlation between postcibal symptoms and what according to current conceptions is called allergy.* But the results obtained here do not warrant any contention that postcibal symptoms are due to allergy. The correlation established may be attributable to a more general factor, connected with the structure of the personality or the constitution of individuals in the respective groups. However, *several circumstances,* especially intolerance for small amounts of particular foodstuffs and the presence of allergic symptoms concurrent with other postcibal symptoms, *indicate that in certain cases and on certain occasions it may be justifiable to ascribe the postcibal symptoms to food allergy.*

Case 19 may be referred to in this connection (see pp. 50, 79, 81). There are good grounds for suspecting milk allergy in this case.

The patient was partially gastrectomised in 1944 (B I), and in 1946 underwent reoperation (B II) for anastomotic ulcer. He had not experienced allergic symptoms prior to the first operation, but ever since that operation he had had undiminishingly severe postcibal symptoms *(grade pc 3).* The symptoms were usually of a shock character, and sometimes followed by soreness of the eyes and small urticarial wheals on the face. He was very sensitive to milk and milk foods. Skin tests showed a ++ reaction to boiled milk, but no other positive reactions. Injection of epinephrine while the postcibal symptoms were in progress quickly dispelled them.

It seems probable that the small intestine is the seat of the allergic reactions presumed sometimes to give rise to postcibal symptoms. The small intestine of gastrectomised patients usually has to cope with food not properly predigested. In other words, the symptoms might be due to a gastrointestinal allergy.

It is usually difficult to diagnose gastrointestinal allergy with the methods at present available. In most cases it is not possible to establish more than a certain likelihood. No symptoms are in themselves characteristic. But it is noteworthy that the symptoms observed in what are very probably conditions of gastrointestinal allergy (see e.g. Hansen (1943), Doerr (1944), Urbach and Gottlieb (1946)) are almost all to be found among pronounced postcibal symptoms reported for gastrectomised patients.

Doerr, for example, mentioned the following symptoms as common in attacks of gastrointestinal—especially intestinal—allergy:

Distension and indescribable apprehensive feeling in the abdomen; weakness and utter incapacity for bodily exertion; apathy or uneasiness; facial pallor; moistness and sweating about the body; and often headache and palpitations. Sometimes there were abdominal pains and diarrhoea. Patients recovered completely from an attack in an astonishingly short time.

Other symptoms typical of gastrectomised patients' postcibal symptoms have also been discussed in connection with food allergy. This latter field is attracting increasing attention (for references see Hansen (1943), Kaijser (1946), Urbach and Gottlieb (1946), Miller (1947), Rinkel *et al.* (1951), and Andresen (1953)). Milk, eggs, and cereals —which are foodstuffs often giving rise to postcibal symptoms— are regarded as the foodstuffs most commonly giving rise to allergic symptoms. These latter vary according to the "shock tissue" involved. The incidence of food allergy has been much disputed, but the majority of authors regard ingested antigens as of less importance than inhalant antigens.

A group of American authors—e.g. Rowe, Coca, Randolph, Rinkel (for references see Coca (1945), and Rinkel *et al.* (1951))—consider food allergy to be common. However, they have counted as allergic many symptoms not generally accepted as allergic—e.g. fatigue, headache, tachycardia, flushing, a sense of warmth, chilliness, and mental confusion with dullness or a sense of being drugged.

Randolph and Rinkel supported their view with the results of provocation and elimination tests, and Coca by an acceleration of the pulse rate after ingestion of the suspect foodstuffs. Rinkel *et al.* (1951) say that these symptoms commonly occurred at a level of sensitisation below that which was usually associated with the production of localised allergic manifestations. There was not always a clear temporal relation with the ingestion of the offending food when it was part of a regular meal, but when it was given under certain test conditions the symptoms often began during the first $^1/_2$ hour after the meal.

Most allergists are sceptical about the above views (Cooke (1947), Chobot (1947), Loveless (1950), Bernton (1951), and others). Loveless has stressed the need for a re-evaluation of the symptomatology of allergy, particularly as regards the claims of Randolph and Rinkel, and for the development of objective methods for the diagnosis of food allergy. She makes special mention of ingestion studies with masked allergens and placebo meals, which often revealed that the above-mentioned symptoms were psychogenic rather than due to the suspected food. Lowell (1950) pointed out that "it is not sufficient to say that an allergic mechanism operates because a certain reaction follows the ingestion of one or more foods" and that the physiological

effect and the psychogenic reactions which might be associated with certain foods must also be taken into account.

This scepticism seems warranted in many respects. The diagnostic methods used by Coca, Randolph, and Rinkel do not prove that such symptoms as fatigue, and so on, are really due to food allergy in the individual case. Nonetheless it is of interest to note that the very symptoms that are characteristic of gastrectomised patients' postcibal distress have been discussed in connection with food allergy.

The investigation produced one result that may be of practical significance. Persons with a definite allergy are particularly liable to postcibal symptoms after partial gastrectomy. There is thus reason to consider a patient's allergy history when deciding whether or not to operate for chronic peptic ulcer. If definite allergy, such as asthma, vasomotor rhinitis, recurrent or chronic urticaria, or chronic allergic eczema is present, greater caution than generally should be observed in deciding to operate, especially as regards women.

CHAPTER 9

Radiological Examinations

The appearance of the gastric remnant and small intestine was studied radiologically after ingestion of barium meal containing some liquid food—usually milk. At first, most attention was paid to the small intestine, since I had observed pronounced functional changes in cases where postcibal symptoms occurred during the examination. However, further experience showed that such changes occurred even in the absence of postcibal symptoms. Other results of interest were obtained, although the examination procedure was not so uniform as could be desired.

Postcibal symptoms did not always occur, even when the patient generally experienced symptoms after the food in question. The patients did not know what their barium meal contained.

Two proprietary brands of barium sulphate with "protective colloids" ("Astrabaryt" and "Unibaryt") were used, suspended either in the liquid or in plain water. A total of 196 examinations were carried out: 97 by the Chief Radiologist at Karlskoga and his staff, and the rest by myself.

In order to obtain an estimate of the rate of emptying of the gastric remnant, and of the spreading of the barium meal in the intestines, I have attempted a rough assessment of the radiographs in the following way.

Retention in the gastric remnant:

Considerable—well over half the barium meal retained.
Moderate—at least a quarter of the barium meal retained.
Slight—at least a tablespoonful of the barium meal retained, or considerable mucosal smearing.
Practically absent—only slight mucosal smearing, or no visible barium meal.

The spread in the small intestine:

Slight—only the first jejunal coils contained barium meal.
Moderate—most of the jejunum and perhaps part of the ileum contained barium meal.
Considerable—a large part of the ileum contained barium meal.

It is obvious that such estimation cannot be better than approximate.

Comparison examinations with barium-water meal and barium-food meal.

Some of the "Karlskoga" patients with B I and B II ops. were examined twice—first with a barium-water meal, and later with a barium-food meal.

Method

The patients were examined in the morning, after they had fasted since the evening before. The interval between the examinations was about 5 days. The number of patients in the different groups varies somewhat, because not all were able to attend for the second examination, and not all the radiographs were suitable for definite conclusions.

Barium-water meal. 19 patients with B I ops. and 32 with B II ops. were examined. After studying the emptying on the screen, radiographs were taken 5 mins. (standing position), 20 mins. and 90 mins. (prone position) after ingestion of the barium meal. This consisted of 75—100 g of "Astrabaryt" made up in plain water to 200 ml. The patients sat down between exposures.

Barium-food meal. 18 patients with B I ops. and 28 with B II ops. were examined. They were not screened; radiographs were taken after the same intervals as in the first examinations. 75—100 g of "Astrabaryt" was mixed with milk, dry powdered milk and ordinary milk, oatmeal gruel, fruit soup, or other liquid foods. The resulting meal was 200 ml in each case.

Inspection of the radiographs gave the following results.

Op. method	Type of barium meal	Gastric retention in 5 min. radiographs			
		Considerable	Moderate	Slight	Pract. abs.
B I	Ba-water	5	4	6	3
B I	Ba-food	6	5	2	1
B II	Ba-water	1	1	15	13
B II	Ba-food	4	5	8	6

3 B II cases showed very rapid emptying with barium-water meal, that is the meal rushed directly into the jejunum.

		Gastric retention in 20 min. radiographs			
B I	Ba-water	1	2	8	8
B I	Ba-food	5	8	3	2
B II	Ba-water	—	1	8	23
B II	Ba-food	3	10	9	6

		Spread in the small intestine in 20 min. radiographs		
		Slight	Moderate	Considerable
B I	Ba-water	7	9	3
B I	Ba-food	3	4	11
B II	Ba-water	7	17	8
B II	Ba-food	1	5	22

The examinations showed that with the *barium-water meal* the gastric remnant was usually more retentive in B I cases than in B II cases. The difference was small in the 20 min. radiographs; with few exceptions there was at most only slight retention. The spread in the small intestine was usually somewhat greater in the B II radiographs than in the B I at 20 mins.

The gastric remnant was considerably more retentive with the *barium-food meal* than with the barium-water meal, with the same difference as above between the B I and B II cases. There was a moderate remainder in most of the 20 min. radiographs. The spread of the barium-food meal in the small intestine in the 20 min. radiographs was considerably larger than with the barium-water meal.

The smaller differences observable in the 90 min. radiographs were similar as regards B I and B II ops., as well as barium-water and barium-food meals. Most of the barium meals were then in the ileum, and had sometimes reached the caecum.

The results were also divided according to the degree of the patient's postcibal distress.

Among the patients examined with the barium-water meal, the numbers with different grades of symptoms were as follows:

B I: pc 0—8, (pc)—6, pc 1–3—5. B II: pc 0—11, (pc)—9, pc 1–3—12.

The results are given in the following table.

Grade of postcibal symptoms	*B I ops.*				*B II ops.*			
	Gastric retention in 5 min. radiographs							
	Consid.	Mod.	Slight	Pract. absent	Consid.	Mod.	Slight	Pract. absent
pc 0	3	2	3	—	—	—	4	5
(pc)	1	1	1	3	—	—	3	6
pc 1—3	1	1	2	—	1	1	8	2

Of the B II cases with very rapid emptying of the barium-water meal, 1 belonged to grade pc 0, 1 to grade (pc), and 1 to grade pc 3.

	Gastric retention in 20 min. radiographs							
pc 0	1	1	4	2	—	—	3	8
(pc)	—	1	2	3	—	—	3	6
pc 1—3	—	—	2	3	—	1	2	9

	Spread in the small intestine in 20 min. radiographs					
	Slight	Mod.	Consid.	Slight	Mod.	Consid.
pc 0	4	4	—	2	9	—
(pc)	1	4	1	—	3	6
pc 1—3	2	1	2	5	5	2

In both the B I and B II groups, the gastric retention was on an average the same for patients with postcibal symptoms as for those without. The spread in the small intestine was on an average somewhat greater for the latter patients, but the differences are small. A similar classification of the results obtained with barium-food meals showed variations of the same kind as will be considered in the next paragraph. However, since different foods were given with the barium meal to these patients, comparison between the cases with postcibal symptoms and those without is not really justified.

Examinations with barium-food meals

The gastric retention and the spread in the small intestine following a barium-milk meal were estimated for a series of Uppsala patients.

42 B II cases were examined, in the afternoon after 5 hours' fasting. The barium meal consisted of 100 g "Unibaryt" made up in milk to 300 ml. Radiographs were taken 5 mins. (standing position), 15 mins. and 30 mins. (prone position) after ingestion of the meal. The patients were screened during the first 5 mins., and occasionally later as well.

17 of the patients had symptoms of grade pc 0, 4 grade (pc), and 21 grades pc 1—3. Examination of the radiographs gave the following results.

Grade of postcibal symptoms	Considerable	Moderate	Slight	Pract. abs.
	Gastric retention in 5 min. radiographs			
pc 0	5	7	3	2
(pc)	2	—	2	—
pc 1—3	2	5	8	6
	Gastric retention in 15 min. radiographs			
pc 0	4	8	3	2
(pc)	2	—	2	—
pc 1—3	—	7	6	8
	Gastric retention in 30 min. radiographs			
pc 0	1	7	7	2
(pc)	—	1	3	—
pc 1—3	—	6	6	9

	Slight	Moderate	Considerable
	Spread in the small intestine in 15 min. radiographs		
pc 0	5	9	3
(pc)	2	2	—
pc 1—3	—	9	12
	Spread in the small intestine in 30 min. radiographs		
pc 0	3	6	8
(pc)	—	2	2
pc 1—3	—	6	15

There were 8 cases with postcibal symptoms of grades pc 2—3. The results in these cases were not different from those for patients with symptoms of grade pc 1.

On an average the gastric retention was somewhat greater among patients without postcibal symptoms than among those with them, and the spread in the small intestine somewhat less. Many patients with postcibal symptoms of grades pc 1—3 had a moderate gastric retention for up to 30 mins. after the ingestion of the barium-milk meal.

Of the above-mentioned patients examined in Karlskoga and Uppsala, 13 had symptoms, resembling those they experienced after meals, during the radiological examination with the barium-food meal. In the 5 min. radiographs, the gastric retention was moderate in 2 cases, slight in 5, practically absent in 4 (no assessment in 2 cases). Thus, the gastric retention was somewhat less for these patients than for others who normally had postcibal symptoms, and obviously less than for those belonging to grade pc 0. The spread in the small intestine was rather greater in cases with symptoms during the examination than in the others. 4 Karlskoga cases all showed considerable spread after 20 mins. In 9 Uppsala cases there was considerable spread in 8 cases and moderate spread in 1 case, after 30 mins.

Some other patients (including 15 with postcibal symptoms of grades pc 2—3) were examined with barium-food meals of various kinds (oatmeal gruel, dry powdered milk and ordinary milk, cream and milk), and various sizes.

The results in these cases accorded with the above. It is noteworthy that moderate gastric retention and considerable spread in the small intestine fairly often concurred in patients who experienced postcibal symptoms. In 2 patients who felt hot and very faint, and sweated, the barium meal reached the caecum in 16 and 17 mins. respectively, but there was then still moderate retention of the barium meal in the gastric remnant.

Patients examined with barium-food meals often felt somewhat full and distended in the abdomen—usually when the gastric remnant emptied rapidly—without having any real postcibal symptoms. Patients examined with barium-water meals occasionally had the same feeling. Two patients who normally had unusually severe postcibal symptoms experienced tiredness, slight nausea, and abdominal aches; one of them (case 19) was also warm and sweaty. The symptoms were mild, however.

Summarising:—*The emptying of the gastric remnant* was faster with barium-water meals than with barium-food meals, and for both types of meals the emptying was slower in B I cases than B II cases. There was no appreciable difference between patients with postcibal symptoms and those without as regards the emptying of barium-water meals. But barium-food meals were on the whole emptied more rapidly in patients with postcibal symptoms, especially among those who had symptoms during the examination.

The spread in the small intestine was more rapid with barium-food meals than with barium-water meals. The intestinal spread of barium-

water meals was slightly more rapid among patients with postcibal symptoms than among those without. This difference was more pronounced with barium-food meals. Rapid spread was especially common among patients with postcibal symptoms during the examinations.

Other observations in connection with radiological examinations

The first gulps of a barium meal usually passed quickly into the intestine. Then the gastric remnant was more or less filled by the rest of the meal, especially when it was a barium-food meal. If the gastric remnant was filled, there was more likely to be a *rhythmic evacuation* afterwards.

Among the Karlskoga cases previously mentioned, such evacuation occurred with the barium-water meal in 14 out of 19 B I cases, and 12 out of 32 B II cases. There was no correlation between rhythmic evacuation and the grades of postcibal symptoms (9 among 19 pc 0 cases, 7 among 15 (pc) cases, and 10 among 17 pc 1—3 cases).

This rhythmicity was studied in some examinations with barium-food meals, where it was seen fairly often. In isolated cases it seemed to be concurrent with the inspiratory movements, but usually it was due to the activity of the duodenum or jejunum adjoining the new stoma, or a few cm from it—see Pl. I and IV. No definite instance of stomatic closure resembling that of a pylorus was observed. Where the stoma sometimes seemed to close, the movement was associated with a contraction of the duodenum or jejunum adjoining the stoma.

Where postcibal symptoms occurred during the radiological examination, the emptying of the gastric remnant was often seen to stop when the symptoms commenced. The emptying proceeded once more when the symptoms abated.

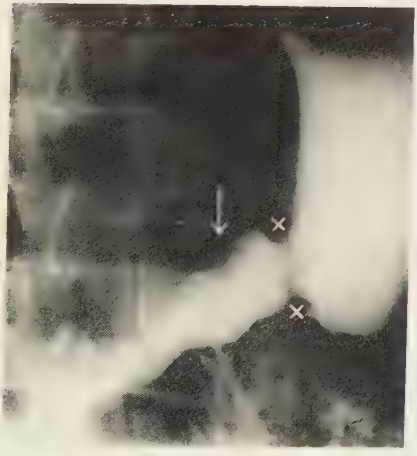
No definite case of *gastric distension* was observed during examinations with barium meals.

In order to provoke such distension, 32 patients were asked to drink as much water as they possibly could 1/2—1 hour after the ingestion of the barium-food meal—in some cases the patient drank as much as 900 ml. Any remains of the barium meal were seen to leave the gastric remnant rapidly, and the spread of the barium meal increased considerably. The gastric remnant was as a rule greatly distended—sometimes almost spherical—with a liquid level in the radiograph as much as 14 cm long.

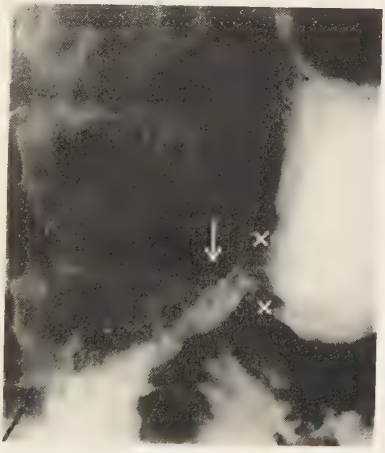
The patients often felt very full, and some patients—whether they normally had postcibal symptoms or not—felt faint and warm for 1—2 mins., but a few with considerable distension did not feel anything at all. Most of the water usually seemed to be retained in the gastric remnant for a few minutes.

Some *reflux to the duodenum* was occasionally seen in B II cases, but never gross reflux with dilatation. Reflux was as frequent among patients with postcibal symptoms as among those without.

a



b



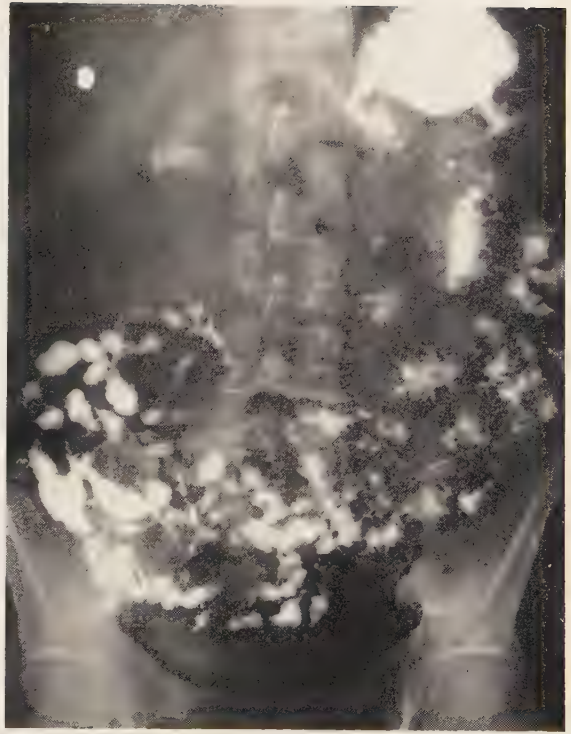
c

Rhythmic evacuation of the gastric remnant.

U 336/42. Mill worker, underwent B I op. for duodenal ulcer at age of 34. Examined with barium-milk meal 10 years later. The contrast meal at first ran into the intestine uninterruptedly (a), but a rhythmic evacuation developed later (b and c), due to activity of the duodenum (↓) just below the stoma (×).

The patient had postcibal symptoms of grade pc 1 (fatigue, distension of the abdomen, nausea, dizziness, feeling of warmth, and sweating). Milk and milk foods were particularly troublesome. He had the usual symptoms 11 mins. after he had drunk the contrast meal, and they continued for 50 mins.

U 2829/48. Engineer, underwent B II op. (a. c. + e. a.) for gastric ulcer at the age of 47. Examined with barium milk meal 3 years later. The evacuation of the gastric remnant was slow, as was the passage of the meal through the small intestine. The radiograph—taken 15 mins. after ingestion of the meal—shows a coarse and irregular mucosal pattern and segmentation of the small intestine. He had never had postcibal symptoms, and had no symptoms during the examination.



U 707/51. Business man, underwent B II op. (r. c. + e. a.) for duodenal ulcer at age of 64. Examined 1 year later with barium-milk meal. The radiograph—taken 30 mins. after ingestion of the meal—shows considerable spread of the contrast medium. The mucosal pattern is irregular, the intestine segmentated. He had never had postcibal symptoms, and had no symptoms during the examination.

K 1751 45. Tool grinder, underwent B I op. for duodenal ulcer at age of 30. Examined 3 years later with barium-milk meal. The radiograph —taken 20 mins. after ingestion of the meal— shows considerable spread of the contrast medium. The contrast medium is scattered, the mucosal pattern rather coarse, and the intestine segmentated. The patient had postcibal symptoms of grade pc 1 (distension of the abdomen, nausea, vomiting, feeling of warmth, sweating, sometimes headache). Mild symptoms of this kind occurred during the examination.

U 1660/48. Housewife, underwent B II op. (r. c. + e. a.) for duodenal ulcer at age of 35. Examined 3 years later with barium-milk meal. The radiograph—taken 30 mins. after ingestion of the meal—shows considerable spread of the contrast medium, with segmentation of the intestine and flocculation of the contrast medium in the aboral parts. The patient had postcibal symptoms of grade pc 1 (tiredness, nausea, feeling of warmth, sweating, difficulty in breathing); tolerated milk well. After ingestion of the contrast meal her stomach felt full and heavy, and 6 mins. later she felt tired and wanted to lie down. After 14 mins. she became dizzy, felt sick and hot in the face. The symptoms were still present when the radiograph was taken.

Bulge of the jejunum opposite the stoma (×), and rhythmic evacuation of the gastric remnant due to activity of the duodenum just below the anastomosis (↓).
U 2021/41. Builder's carpenter, underwent B II op. (r. c.) at age of 33. Examined with barium-milk meal 10 years later. A rhythmic evacuation was clearly seen. He had symptoms of grade pc 1 (tiredness, sweating, and palpitations). He usually did not tolerate milk, but had no symptoms during the examination.

B II cases often evidenced a *bulge of the jejunum opposite the stoma* (Pl. IV). Among the 42 B II cases examined with a barium-milk meal, an obvious bulge of the type seen in Pl. IV was observed about as often in patients with postcibal symptoms as in those without (10 out of 17 pc 0 cases, 2 out of 4 (pc) cases, and 9 out of 21 pc 1—3 cases).

In the same series, an obvious *distension of parts of the jejunum below the anastomosis* was observed in 17 cases. Cases with postcibal symptoms did not differ from those without in this respect.

The width of the jejunum in the radiographs was at least 3.5 cm in 8 pc 0, 1 (pc), and 8 pc 1—3 cases. Distension was more frequent in radiographs taken during the first 5 mins. Among patients who experienced postcibal symptoms in the course of the examination, any distension of the intestine had almost invariably disappeared when the symptoms commenced—usually 10—20 mins. after ingestion of the barium-food meal.

When a barium-food meal was given, the *motoric activity of the small intestine* was intense, as seen in screening. The vigorous intestinal movement, together with stimulated intestinal secretion, probably accounted for the blurred intestinal contours in many of the radiographs.

The *mucosal pattern of the small intestine* in radiographs taken with *barium-water meals* was usually delicate, though the mucosal folds were sometimes coarse or irregular. As is well known, the variability of the mucosal pattern is considerable even under normal conditions (cf. Golden (1945), Naumann (1948), Lönnerblad (1951), Schinz *et al.* (1952)). Among the Karlskoga cases examined with barium-water meals, there was a mucosal pattern possibly indicative of enteritis both among patients with postcibal symptoms and among those without.

The mucosal pattern in examinations with *barium-food meals* varied much more than in those with barium-water meals. The pattern was in the main similar to that seen with barium-water meals during the first few minutes after the ingestion, but usually it then became increasingly irregular and ragged, with coarse mucosal folds, segmentation, and the lumen irregular, often narrow (Pl. II—III). Such changes were observed about equally often among cases with postcibal symptoms as among those without. Pronounced changes of this type occurred among Uppsala cases examined with barium-milk meals: 8 out 17 pc 0 cases, 2 out of 4 (pc) cases, and 8 out of 21 pc 1—3 cases. 5 of the 9 cases with postcibal symptoms during the examination exhibited such changes. Among patients examined with other kinds of barium meal, such mucosal changes appeared to be more common in those who had symptoms during the examination than in those who had not. The various foods given produced all the various types of pattern.

Summarising:—Patients with postcibal symptoms did not differ from those without as regards rhythmic evacuation of a barium meal from the gastric remnant, reflux to the duodenum, and distension of

the jejunum. The small intestinal pattern was often very irregular after a liquid barium-food meal, whether or not the patient normally had postcibal symptoms, though it was so somewhat more often where postcibal symptoms occurred during examination.

Discussion

The examinations have shown that, in general, gastrectomised patients who had relatively slow *gastric emptying* and a relatively slow *passage through the small intestine* on examination with a barium-food meal seldom had postcibal symptoms. Rapid emptying of the gastric remnant and rapid passage through the small intestine were observed both in patients with postcibal symptoms and in those without, but more often in the former.

However, patients with postcibal symptoms did not invariably exhibit a rapid emptying of the gastric remnant, not even if they had an attack of postcibal symptoms during the examination. But a rapid passage of the barium-food meal through the small intestine was common in these cases. Such differences were less distinct on examination with barium-water meals.

The occurrence of "dumping" in examinations with barium-water meals does not mean that the patient suffers from postcibal distress (cf. p. 13), and the term "dumping syndrome" is for this reason inappropriate as a description of postcibal symptoms—as already mentioned by Capper (1952) and Pulvertaft (1952), among others. The examinations with barium-food meals nevertheless show that there is some justification for the use of this term.

There are many substances which produce *increased motor activity of the small intestine* when ingested. This has been shown radiologically to be the case for e.g. milk, hypertonic solutions of sugars, fats (see, for instance, Pendergrass *et al.* (1936), Golden (1945), Naumann (1948), Glazebrook and Welbourn (1952)). Glazebrook and Welbourn suggested that the increased motor activity is the cause of postcibal symptoms (cf. p. 15). However, the present investigation with barium-food meals shows that even patients without postcibal symptoms may have increased motor activity, with rapid spread in the small intestine, although it is not quite so common as among those with postcibal symptoms.

The *small intestinal pattern* seen in cases examined with barium-food meals often resembled the so-called "deficiency pattern", the pattern of a disordered motor function (Golden (1945)). The cause of this pattern is not clear, but Frazer *et al.* (1949) showed that when pure barium sulphate is used it is sometimes due to a flocculation of the contrast medium with mucus in the lumen of the intestine. The "abnormal" pattern is not specific, as it may be induced by many sub-

stances, such as various foodstuffs, hypertonic solutions of glucose and various salts (see, for instance, Pendergrass *et al.* (1936), Naumann (1948), Frazer *et al.* (1949)). When barium sulphate with protective colloids is used such a pattern is seldom found (French (1950), Zimmer (1951)).

Some authors (e.g. Golden (1945), Tallant *et al.* (1949), Lepore *et al.* (1951)) attributed the "deficiency pattern" to allergic reaction in many cases, because it was observed when patients allergically sensitive to foodstuffs were given these in the contrast meal. Wing and Smith (1942), and Cooke (1947) pointed out, however, that such changes must be assessed with caution, because of the influence of nutritive foods on the behaviour of the small intestine.

The present investigation shows that the "deficiency pattern" is not infrequently found in patients who do not normally have symptoms from the foods concerned, and in spite of the fact that barium sulphate with protective colloids was used. It therefore seems probable that the "abnormal" pattern seen in the barium-food examinations was due to physiological activity of the intestine in response to food. It seems impossible to decide from radiographs whether or not an allergic mechanism is sometimes involved.

Tests with the drinking of large quantities of water following a barium-food meal suggest that considerable *gastric distension* may sometimes provoke postcibal symptoms. However, the quantity drunk was exceptionally large, and the symptoms may sometimes have been due to an accompanying rapid emptying of the gastric remnant and the rushing of the water and barium meal through the small intestine.

Rhythmic emptying of the gastric remnant seemed to be due to the activity of the attached small intestine (cf. also p. 14), and was seen as often in cases with postcibal symptoms as in those without.

The present investigation provides no confirmation for the opinion of Porter and Claman (1949), Ogilvie (1952), and others, that *bulging of the jejunum opposite the stoma in B II cases* may give rise to postcibal symptoms. There is nothing definite to suggest that *radiologically visible jejunal distension* or *moderate duodenal reflux* are of any great importance as regards postcibal symptoms.

There were only small differences between patients with postcibal symptoms and those without, as far as the radiological examinations with liquid contrast meals were concerned. Such as were apparent were associated with the emptying of the gastric remnant and the intestinal activity. They were more marked when barium-food meals were used, and very slight with barium-water meals.

CHAPTER 10

Tests on a Patient with Ileal Fistulas

Tests were carried out on a patient with multiple ileal fistulas. A fuller account will be published later, in collaboration with Ivar Werner, M. D. (cf. Werner (1953)). Some of the results have a certain interest as regards postcibal symptoms, and they will therefore be briefly mentioned here.

The patient (K 439/49) was a non-gastrectomised woman born in 1912, and operated on for ileus in 1949. Multiple ileal fistulas later developed, necessitating several secondary operations, including an anastomosis between the middle of the small intestine and the transverse colon, the small intestine being closed on the aboral side of the stoma. There finally remained a circular area on the lower part of the abdomen, about 10 cm in diameter, and covered with intestinal mucosa. In the upper part of this region were 6 openings to intestinal loops. One fistula was blind. One led to the caecum, and the other 4 were joined in pairs to intestinal loops which were about 8 cm and 20 cm long. The patient was examined in 1951, when her general condition and working capacity were good. She was examined lying on her back. Both the mucosal area and the fistula openings were in almost continual movement, with about 8 contractions per minute. The mucosal surface was normally covered by a clear transparent film of mucus, and there was a slight discharge of thin mucus and small pieces of detritus from the fistula openings.

The mucosal surface was insensitive to touch; hard rubbing with a pad of cotton-wool caused a persistent contraction of the mucosal area, and a feeling of contraction in the abdomen, without any pain. Insertion of a finger in any of the openings caused mild nausea, a faint ache in the epigastrium, and slight drowsiness. To study the reaction to mechanical distension, a thin cylindrical rubber balloon—3.5 cm in diameter and 5–10 cm long—was introduced into a fistula, and partly filled with water. (The quantities of water used were only a part of the capacity of the uninflated balloon.) The pressure in the balloon was recorded on a smoked drum by means of a mercury manometer. The test was repeated several times.

A pressure of 15—20 mm Hg produced a feeling of distension and slight pain located in the epigastrium. As the pressure increased, the discomfort became worse, and the pain increased considerably. At 30 mm pressure the patient became tired and drowsy as well, hot in the face, felt somewhat sick, and sometimes had palpitations and slight pain above the eyes. Higher pressure—up to 100 mm—led to severe pain, salivation, and almost to fainting. All symptoms disappeared at once when the balloon was emptied, except when the pressure had been high, when the tiredness might persist for 1—2 minutes. When the balloon pressure was at least 20 mm, the systolic blood pressure rose from 90—110 mm Hg to 120—140 mm.

The tapered ends of glass tubes of 1 cm^2 cross-sectional area were introduced into each end of the 20 cm loop of intestine, so that water-tight connections were obtained. The tubes were clamped in a stand. With the patient resting, liquid gradually filled the tubes to a height of 3—6 cm above the mouths of

the fistulas. If one of the tubes was filled with water to a height of 12—13 cm (9—10 mm Hg), the patient had a feeling of repletion and moderate distension in the epigastrium. The liquid level tended to fall, but if it was maintained by adding water, the feeling of distension and repletion gradually increased. When the test had been in progress half an hour, the patient felt some difficulty in breathing, belched repeatedly, and was perhaps somewhat tired, but otherwise felt all right.

40 % glucose—5–10 ml—was instilled into the instestinal loop through catheters introduced down the glass tubes. The intestine quickly became very active, and pressed out the greater part of the solution up the outside of the glass tubes. In some of these tests, the patient rapidly became very tired, felt giddy, had palpitations, her pulse and blood-pressure increased somewhat, and waves of heat rose up to her face, which sometimes flushed. She experienced little or no pain. The symptoms disappeared after a couple of minutes.

It is obvious that the results of these tests cannot be applied directly to the postcibal symptoms of partially gastrectomised patients. They were for one thing carried out on intestine that was more or less abnormal and for another, the conditions did not correspond to those associated with the eating of food. Nevertheless, they agree well with the findings of other authors in tests on gastrectomised patients.

Distension of the small intestine with a balloon did not produce postcibal-like symptoms until considerable pain had developed (cf. p. 14). Slight pressure in an isolated segment of the intestine—insufficient to cause pain—gave rise to a feeling of distension and repletion, similar to what Butler and Capper (1951) found for gastrectomised patients (cf. p. 14). The fact that the introduction of concentrated glucose solution into the small intestine produces symptoms resembling postcibal ones is well known (p. 15). As previously mentioned, Machella (1949, 1950) regards this as due to osmosis causing distension of the small intestine. The tests reported here show that small amounts of glucose may also produce symptoms of this kind. Glazebrook and Welbourn (1952) obtained similar results with the intrajejunal instillation of concentrated glucose in gastrectomised patients—in one case with only 5 ml. It is unlikely that distension of the intestine gives rise to the symptoms in these cases; it is more probable that the irritation of the jejunal mucosa by the glucose is the cause of the symptoms.

CHAPTER II

Weight Changes after Operation

The patients were asked about their weight at the time of the interview, as compared with the average weight before. They were generally able to give the change in weight to within two kilograms or so.

The method is open to objection. More exact figures would have been obtained if the weight immediately before the operation had been compared with the weight at the time of interview. But many of the patients were unusually thin just before operation. Moreover, a check of weighing-machines in the different hospital wards showed a variation of about 4 kg at an average weight of 65 kg. Another point, of course, is that a weight change of 5 kg is of greater significance for a person weighing 50 kg than for one weighing 80 kg. The following results are therefore presented with due reservations.

The computations have been made on data from 443 men who were able to give definite information about their change of weight. Of the 48 cases (9.8 %) not included, some had suffered a considerable decrease in weight on account of other illness, and others were gastrectomised more than once; others were not able to give any definite figures, presumably because their weight had not altered to any great extent. The proportion of cases excluded is small, and it seems safe to assume that their exclusion has not appreciably altered the results. Weight changes of 3—4 kg have been included in Figs. 6 A and B, and changes of 5 kg or more have been indicated.

Weight changes in patients with different grades of postcibal symptoms

Increase in weight was most common among patients without postcibal symptoms, and decrease more common as the symptoms were more severe. Nevertheless, there was a considerable decrease in weight in some cases without postcibal symptoms (Fig. 6 A).

There are statistically significant differences between grade pc 0 and grades pc 1—3 as regards both increase and decrease of weight of at least 5 kg.

The differences are:

increase of at least 5 kg: 15.9 ± 3.1 % (percentage for grade pc 0: 19.9 ± 3.1 %, percentage for grades pc 1—3: 4.0 ± 1.6 %),

decrease of at least 5 kg: 28.1 ± 4.7 % (percentage for grade pc 0: 10.8 ± 2.4 %, percentage for grades pc 1—3: 38.9 ± 4.0 %).

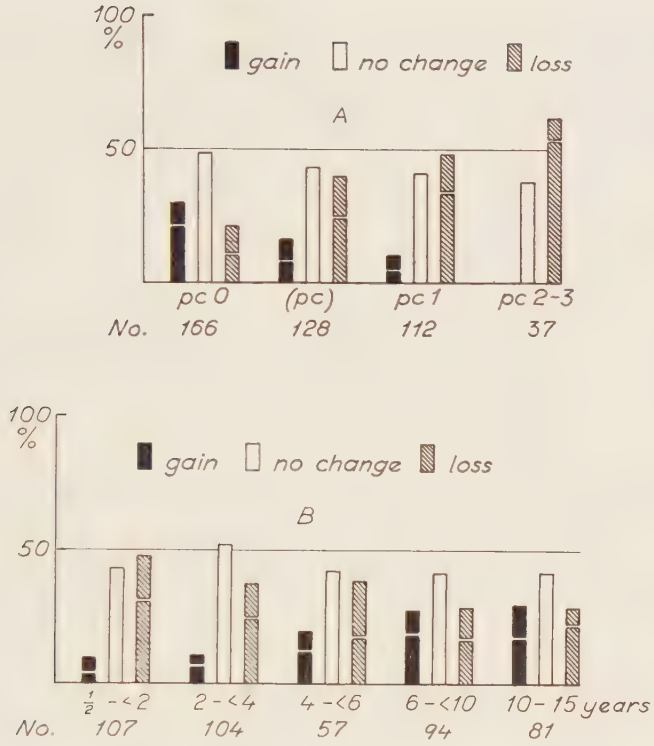


Fig. 6. Changes in weight among men from the years prior to op. to the time of interview. Changes in weight included are at least 3 kg. The lower sections of the black and shaded columns refer to changes of at least 5 kg. The figures denote the number of patients in each group.

A. Changes in weight among patients with different grades of postcibal symptoms.
B. Changes in weight in relation to the follow-up interval.

Patients with definite postcibal symptoms thus often had difficulty in increasing their weight. This applied particularly to those with moderate and severe postcibal symptoms (grades pc 2—3), where the patients were often markedly thin. 32.4 ± 7.8 % of them had lost at least 10 kg, as against 2.4 ± 1.2 % of those without postcibal symptoms. Among these latter, 9.6 ± 2.4 % weighed at least 10 kg (in a few cases 20—30 kg) more than they used to weigh before the operation, as against 0.7 ± 0.7 % (1 patient with grade pc 1 symptoms) among those with definite postcibal symptoms.

Weight changes in relation to the follow-up interval

Patients generally stated that it was difficult to keep up their weight during the first years after the operation, but that it subsequently increased gradually from year to year. Fig. 6 B gives the changes of weight in men, with respect to the follow-up interval. The longer the interval, the more often is the weight greater than the average preoperative weight, and the less often is it smaller. About 20 % of gastrectomised men nevertheless continued to be about 5 kg underweight, as compared with the years prior to the operation.

Weight changes varied but little with the *age at operation*. There was somewhat more often an increase and more seldom a decrease in weight among patients in the age group 50—59 years, and somewhat more often a decrease in weight among patients at least 60 years old at operation. The reason may be that persons over 50 years old are usually less bodily active in their work, and that old people are often subject to a physiological decrease in weight.

There is no variation among the men when they are divided up according to the *different types of operation*. In comparable groups of B I and B II operations (cf. Table VIII) the results were:

B I: increase of at least 5 kg—13 %; decrease of at least 5 kg—18 %.
B II: increase of at least 5 kg—17 %; decrease of at least 5 kg—21 %.

Results for *women* are similar, except for B I and B II ops. In comparable groups (cf. p. 38), 10.0 ± 5.6 % of 30 B I ops. and 36.0 ± 9.8 % of 25 B II ops. weighed at least 5 kg less than the average preoperative weight.

Discussion

It is generally recognised that many patients have difficulty in maintaining their weight after partial gastrectomy (Pulvertaft (1952)), and others; for references, see Ivy *et al.* (1950) and Everson (1952)).

My results show that an obvious decrease in weight compared with the average preoperative weight was particularly prominent among patients with postcibal symptoms, and stronger the more severe the symptoms. This indicates that postcibal symptoms may have an adverse effect on the patient's nutrition. The most important causes of many patient's inability to attain a satisfactory weight probably are difficulty in eating adequately (see Chapter 5), and the rapid passage of meals through the small intestine, which seems to be rather more common where postcibal symptoms occur (see Chapter 9). It is well known that a rapid passage through the small intestine, especially during the first 15—30 mins. after a meal, may impair the digestion and absorption of food, because, for one thing, the food is not properly mixed with the bile and pancreatic juices.

As far as I know, only Pulvertaft (1952) has studied the relationship between weight and postoperative symptoms. His results agree with mine.

As time progresses, more and more patients reach their old weight or even more. This is in conformity with the fact that the incidence and severity of postcibal symptoms often decreases gradually with time.

Figures reported in the literature for the percentages of patients gaining or losing weight vary considerably, probably owing to the fact that the postoperative weight is sometimes compared with the immediate, sometimes with the average preoperative weight. Furthermore, there are only a few authors—e.g. Santy et Mallet-Guy (1939)—who have considered the effect of the time after operation on the patients' weight. The results of Santy et Mallet-Guy agree with mine in this respect.

CHAPTER 12

The Relative Importance of Postcibal Symptoms

Postcibal symptoms are often very distressing while in progress, but in spite of this, *the majority of patients attached no great importance to their symptoms. Only about 12 % of all partially gastrectomised patients—those with moderate or severe symptoms—could be said to suffer any real distress* (cf. p. 28).

There are three main circumstances which account for the slight attention most patients paid to their symptoms:

1) The symptoms occurred only after meals, and were of short duration. The patients felt quite well again afterwards. They commonly said that they would feel altogether fit if only they did not have to eat.

2) Patients learned in due course by experience, or, quite frequently, from acquaintances who had themselves been gastrectomised, that their symptoms could be prevented or alleviated if they avoided certain foods, did not drink with meals, did not eat large meals, and so on (cf. Chapter 5). If the symptoms happened to be more severe, they attributed it to their own carelessness.

3) They had little or no pain. For most patients, the main achievement of their gastrectomy was the relief from pain it brought. They regarded this relief as compensation many times over for any postcibal distress they must bear. In other cases, it was a question of relief from dangerous haemorrhage, severe vomiting, or the risk of further ulcer perforations.

Patients with postcibal symptoms of grades (pc) and pc 1 seldom sought the help of a doctor. Nevertheless, the first attacks of postcibal symptoms were sometimes alarming for the patient (and for those around him), if he was not aware that such distress might sometimes occur. But with time patients became used to their postcibal symptoms, and eventually found it quite natural that they had some trouble or that they had to exercise care. They regarded themselves as quite fit, and it was not until leading questions were put to them that their postcibal symptoms were revealed.

The more frequent and more severe symptoms after meals were, the more troublesome they were for the patient. Many of those with symptoms of grades pc 2—3 were continually tired, and had little energy and stamina. They often considered that they had become peevish and

nervous owing to the continual recurrence of the distress. Their work suffered, partly because of their general tiredness, and partly because they were incapable of any work during the first hour or so after eating. As they usually needed to rest after eating, they hardly dared to eat away from home. The attitude of people with good gastric health was often not very understanding, and the same might even be true of doctors they consulted. It is not surprising that these patients were underweight (cf. p. 99), in view of their difficulties in obtaining sufficient nourishment. As a matter of fact, difficulty in gaining weight was often a source of worry for gastrectomised patients. In this connection it may also be pointed out that there is a certain risk of deficiency states arising after partial gastrectomy (cf. Ask-Upmark (1950), Welbourn *et al.* (1951)), especially when the diet is inadequate.

Anaemia is not uncommon after partial gastrectomy (cf. p. 19). Patients' blood values have not been systematically determined in the present investigation. The haemoglobin value, however, was checked in cases with signs of anaemia, or the patients were sent to an internist for examination and treatment. Haemoglobin values of less than 50 % were found in 5 cases (one due to a bleeding carcinoma of the colon).

Patients were asked whether they had any abdominal symptoms not associated with meals. (For cases with anastomotic ulcers, see p. 40.) There were in all 25 patients with chronic symptoms of gastritis, as they are often called, (aches, smarting pain, or soreness, chiefly in the upper abdomen and unassociated with meals, often in connection with bodily exertion, vomiting with an empty stomach, acid regurgitation). Patients with insignificant or occasional symptoms have not been included. Symptoms of this kind were about equally frequent among patients belonging to the different grades of postcibal symptoms (pc 0—7 cases out of 200, (pc)—4/159, pc 1—8/179, pc 2—4/59, pc 3—2/17).

Chronic symptoms of colitis, as they are often called (distension with gas, borborygmus, often for one or more days at a time, diarrhoea unassociated with meals) were reported by 20 patients. Such symptoms were somewhat more frequent among patients with postcibal symptoms (pc 0—2/200, (pc)—5/159, pc 1—8/179, pc 2—3/59, pc 3—2/17), which indicates a possible connection between these symptoms and postcibal symptoms. The numbers are, however, too small for definite conclusions.

Most of the patients with moderate symptoms, and many of those with severe postcibal symptoms, had in time resigned themselves to their condition, and accepted their symptoms as a necessary evil. Even for them, the relief from the pain they had before the operation outweighed these symptoms. But there were 8 patients who regarded their postcibal symptoms as a greater burden than their previous ulcer pain.

These 8 included 4 with grade pc 3 symptoms (one of them case 19), 2 with grade pc 2, and 2 with grade pc 1. The pc 3 cases experienced considerable pain, either in conjunction with their postcibal symptoms or otherwise; 2 of them were operated on of anastomotic ulcers some time after the interview. One of the pc 3 patients, and the 4 pc 1—2 patients were women. The 2 pc 1 cases were obviously hypochondriacs, and their preoperative symptoms had been relatively mild.

It was only natural that similar postcibal symptoms appeared more distressing to patients who had had mild ulcer symptoms than to those who had had more severe ones. However, the incidence of postcibal symptoms did not seem to be influenced by the degree of the indications for operation. In some cases, this indication was—according to the case records—weak (the ulcer symptoms of short duration, no medical treatment), but the incidence of postcibal symptoms in these cases was not different from that for the other patients.

I am of the opinion that although the incidence of postcibal symptoms after partial gastrectomy for peptic ulcer is high, there is no reason to lay too great stress on these symptoms. The earlier ulcer symptoms, particularly the pain, were regarded as worse than the postcibal symptoms by the great majority of patients. Only about 1 % of the total considered that their condition was worse because of the postcibal symptoms. However, for the patients with moderate or severe postcibal symptoms (about 10 % of all gastrectomised men, and 24 % of the women), the symptoms are definitely a problem, and may have a considerable influence on their everyday life and work.

CHAPTER 13

Hypoglycaemic Symptoms

Gastrectomised patients were asked about symptoms which might indicate hypoglycaemia. Attacks of faintness sometimes occurred apparently unassociated with meals. Such distress is here called hypoglycaemic if it occurred 1—4 hours after meals, if there were accompanying tremors, or if the patient found that eating quickly dispelled the symptoms. With these criteria, 78 cases (12.7 ± 1.4 %) sometimes had hypoglycaemic symptoms.

Hypoglycaemic symptoms were of little importance compared with postcibal. They were easily dispelled, and as a rule occurred but seldom—with intervals of months or weeks in between. 9 patients had such symptoms so frequently that they always carried something to eat with them, generally a piece of sugar. Some patients said they had had the same symptoms before operation.

Hypoglycaemic symptoms were more frequent among patients with postcibal symptoms than among those without. The incidence among

200	patients	belonging	to	grade	pc 0	was	5.5 ± 1.6 %
159	,,	,,	,,	,,	(pc)	,,	13.2 ± 2.7 %
179	,,	,,	,,	,,	pc 1	,,	16.8 ± 2.8 %
76	,,	,,	,,	grades	pc 2—3	,,	21.1 ± 4.7 %

The difference between pc 0 and pc 2—3 is statistically significant (D: 15.6 ± 5.0 %).

Women had hypoglycaemic symptoms rather more often than men. It is noteworthy that B I cases had such symptoms more often than B II cases.

B I. Men: 22.6 ± 4.6 % of 84 cases. Women: 44.1 ± 8.6 % of 34 cases.
B II. Men: 7.9 ± 1.3 % of 407 cases. Women: 13.5 ± 3.6 % of 89 cases.

The differences are statistically significant (D men: 14.7 ± 4.8 %; D women: 30.6 ± 9.4 %). This suggests that a duodenal factor may have something to do with hypoglycaemic symptoms. It is of interest in this connection that a number of investigators have observed that extracts of the animal duodenum and upper part of jejunum have a hypoglycaemic effect (for refs, see Babkin (1950)).

Possible preoperative allergy did not affect the frequency of hypoglycaemic symptoms. The percentages of hypoglycaemic symptoms in the same allergy groups as in Table XIX were: 7.8 % in "all—", 8.1 % in "all?", and 10.3 % in "all +".

Evensen (1942) found that 10 out of 95 gastrectomised patients reported hypoglycaemic symptoms. Butler (1951) found that 5.1 % had these symptoms, but he included only cases where hypoglycaemic symptoms were observed in connection with peroral glucose tolerance tests.

CHAPTER 14

Treatment of Postcibal Symptoms

The number of partial gastrectomies performed is steadily rising, and the number of patients consulting doctors for postcibal symptoms consequently increases from year to year. As at least 10 % of gastrectomised persons suffer from distress which cannot be disregarded, the effective treatment of these symptoms has become a matter of increasing concern.

This is reflected in the publications of recent years which have advocated various methods of treatment. These may be divided into three groups:

1) Dietetic and other precautions in connection with meals.
2) Medical treatment.
3) Surgical treatment.

Dietetic precautions have been discussed in Chapter 5. Although opinions differ somewhat, there is general agreement that patients with postcibal symptoms should eat small meals, avoid liquid foods and particular foods to which they are intolerant, rest after meals, and if possible eat lying down.

Patients soon find out for themselves that large meals cause them trouble. On the other hand, there are many who do not discover the advisability of avoiding liquid foods, and there are likewise many who are unaware that they do not tolerate, say, milk and milk dishes. Several patients with moderate or severe postcibal symptoms experienced an immediate improvement when they followed advice on these points. The question of milk is of particular interest in Sweden, since milk and milk foods are an essential part of our diet. Patients not infrequently continue to take such foods even after they have been advised by a doctor not to do so. The patients themselves, or acquaintances in good gastric health, think that milk foods are really the best thing for a weak stomach, or that they are essential for good health.

Medical treatment. Several different agents have been recommended or tried.

For instance,
olive oil (Custer *et al.* (1946)),
dilute hydrochloric acid (Custer *et al.* (1946), Brun and Landelius (1947)),

ephedrine (Custer *et al.* (1946), Gilbert and Dunlop (1947)),
carbamylcholine chloride (Bruusgaard (1946)),
atropine (Machella (1948)),
antispasmodics especially active against Ba-induced spasms, and some adrenolytic agents (Rauch and Bieter (1953)),
some quaternary ammonium derivates with ganglion-blocking activity (Wells and Welbourn (1951), Glazebrook and Welbourn (1952), Rauch and Bieter (1953)),
histamine-antagonising agents (Meurling (1951), Boman (1952)),
local anaestetics given perorally (Meurling (1948), von Dardel and Morales (1951), Balfour *et al.* (1952)),
splanchnic block (cf. p. 19).

The results of the various treatments are generally stated to be good, although most authors either mention only a few cases or do not present any material at all. As far as I know, Rauch and Bieter (1953) are the only ones to have tested different agents thoroughly. They found for 103 patients with postcibal symptoms that antispasmodic agents and Banthine® were most effective (the respective percentages of patients relieved of their symptoms were 35 and 26 %). However, undesirable side reactions sometimes occurred. Adrenolytic agents were found to be not only seldom helpful, but even in many instances to produce an exaggeration of the symptoms. Rauch and Bieter came to the conclusion that no one medication was regularly effective, and that not all patients would consider the same therapy most beneficial.

I am of the same opinion as Rauch and Bieter. Since 1945 I have used procaine hydrochloride (Meurling (1948)), and later tried antihistaminatics, dilute hydrochloric acid, and some other agents. Procaine was useful in well over two thirds of the cases where tried. The effect was in many cases striking, sometimes persisting for a considerable time after the patient had ceased to take the medicine. Antihistaminatics were not so effective, and often produced drowsiness which made it difficult to assess their effect. Hydrochloric acid was effective against diarrhoea, and sometimes for other symptoms.

Patients were usually recommended to change their eating habits at the same time as they were given one of these medicines, and the change of diet often had a beneficial effect that masked the effect of the agent used. Placebos were but seldom tried. However, many patients who found some medicine helpful had previously tried other medicines without result.

Procaine hydrochloride—1–10 cg—was given in a little water a few minutes before the meal. 81 patients reported the results. 31 were relieved of all symptoms; 28 experienced considerable relief; and in 22 cases there was no effect. The effect was usually confined to the meal before which the procaine was taken. Some patients had used procaine now and then for years, always with good results; in other cases the drug lost its effect with time or when tried again. It was remarkable that in about one third of the cases, where there was total or considerable relief, the effect of about a week's treatment lasted from a couple of months to a year. In two cases (both previously with symptoms of grade pc 2) which were

followed up after 2 years (case 42) and 5 years respectively, the symptoms had not returned. Relief was more often achieved in cases with mild postcibal symptoms than where the symptoms were moderate or severe. Side reactions occurred in only two cases (soreness in the abdomen or diarrhoea).

Histamine-antagonising agents of various kinds were given to 30 patients. 7 experienced total relief, 8 some improvement, and there was no effect in 15 cases. In one case, the effect lasted to some extent for a year. Side reactions often made it difficult to use this remedy.

Dilute hydrochloric acid and other acid preparations were tried by 34 patients. 3 experienced complete relief, 14 were somewhat better, and there was no effect in 17 cases. The effect was temporary. Some patients got a sore feeling in the stomach after acid preparations.

Banthine® *and Tannalbin*® (tannin albuminate) were useful in a few cases where other preparations failed, but in others had no effect.

Barbiturates combined with small doses of *atropine* often alleviated the symptoms somewhat.

The beneficial effect attributed to splanchnic block might partly be due to the large amount of anaesthetic injected (cf. p. 19). 10 patients with postcibal symptoms of grades pc 1—3 were given 40—50 ml of 1 % *procaine hydrochloride, injected subcutaneously in the thigh.* 2 of these patients were totally relieved of their symptoms (one of them, case 16, was still free of symptoms 8 months afterwards), 4 had relief for some days or weeks, and 4 were no better.

Where procaine was fully effective, and especially where the effect was lasting, the result was almost miraculous for the patients—particularly when they had had their symptoms for several years. They could eat all kinds of food without difficulty, drink milk, and eat so much that they could not believe it was true. They felt well after eating, and could start work immediately. Their general tiredness disappeared, and their "nerves" got better. There was sometimes 3—4 kg increase of weight in a few months.

But procaine was without effect for many patients, or the effect declined after some time and the postcibal symptoms returned. Other remedies did sometimes give relief, however. In general, it may be said that treatment with various medicines often has a beneficial effect. Attention to the diet is of great importance, however, and in some cases this is the only way in which the patient can obtain relief—at least, until a really effective remedy for postcibal symptoms is found.

Surgical treatment. Various kinds of secondary operations have been recommended.

The surgical modifications of the B II operation, mentioned on p. 43, have also been applied as secondary operations for postcibal symptoms. The respective authors have reported encouraging results. Other publications deal with isolated cases: for instance, Custer *et al.* (1946) and Mikkelsen (1951) found a secondary restriction of the stoma to be effective. Hoffman (1952), on the other hand, considered that such a procedure did not have any effect on postcibal symptoms. The effect of vagotomy seems to vary (cf. p. 19).

Bohmansson (1927, 1950) and Perman (1945, 1947) strongly recommended a B I anastomosis in B II cases with postcibal symptoms, and reported very encouraging results. Perman (1947) and Sjögren (1952) pointed out that results are liable to be uncertain in women, and where the gastric remnant is small. Even if this method is of value in B II cases with postcibal symptoms, there is a drawback—5 of the 35 patients reoperated on by Perman later developed anastomotic ulcers (Sjögren (1952)).

My experience with surgical corrections is very limited, and does not permit of any definite conclusions. As mentioned on p. 38, former B I patients sometimes had more severe symptoms after a secondary B II operation, sometimes milder. The total case material included 4 patients who had a secondary vagotomy. 2 had not improved (case 19 with postcibal symptoms of grade pc 3, and one patient with symptoms of grade pc 2). One patient was completely relieved of earlier postcibal symptoms estimated as of grade pc 2, and one had no postcibal symptoms, neither before the vagotomy nor after.

With the exception of Bohmansson and Perman, surgeons who have performed secondary operations for postcibal symptoms have had quite small series of patients. Further experience with the different secondary operations, and investigations some time after the surgical correction to find to what extent the beneficial effect is lasting, seem necessary before any definite verdict on the efficacy can be given.

In practice, the treatment of a patient with postcibal symptoms which I have found most effective is along the following lines.

A detailed account of the patient's dietary habits is first obtained, and an examination carried out. The patient is advised to avoid liquid foods, and to drink between meals. If he is accustomed to take milk and milk foods, he should try giving them up for some weeks. In fact, the patient should systematically endeavour, by a process of trial and error, to find what foods he tolerates best. When possible, he should eat lying down. The patient is recommended to eat much butter, cheese, crisp bread, meat (without gravy), fish, herring, fried and boiled potatoes (not mashed), fresh and cooked vegetables, and try beer and light ale—always on the assumption that these are well tolerated. He is told that the only dietetic guidance is to avoid everything which does not agree with him, and that what he himself is able to achieve is very important. In addition, he receives procaine hydrochloride or another of the medicines mentioned above.

Where necessary, he is given further advice and another medicine when he returns a few weeks later. One medicine after another may have to be tried in order to find something which at least alleviates the symptoms.

The treatment takes a long time, both for the patient and for the doctor, but there is nearly always an improvement, or even a cure, provided the patient will and can continue as he has begun.

In cases with severe symptoms where the therapy is ineffective, surgical correction may be considered, but it seldom seems to be necessary.

If the patient has abdominal pain, especially such as is not associated with meals, radiological examination for anastomotic ulcer is necessary. Gallbladder diseases must also be borne in mind where there is pain; they appear to be relatively common among gastrectomised persons. Anaemia has to be corrected (this sometimes leads to improvement), as well as other deficiency conditions. Bile and pancreatic extracts may have a beneficial effect when the patient is very much underweight.

I think it is also possible to diminish the severity of postcibal symptoms by *prophylactic measures in the early postoperative period*. As the majority of partially gastrectomised persons get postcibal symptoms, it is advisable to accustom all patients from the very beginning to a diet that experience shows to be least harmful in this respect.

The food given after partial gastrectomy in most hospitals consists of liquids such as gruels, mixtures containing cream and milk, and sweet soups. In recent years I have tried giving patients mainly dry food, without milk foods and sweets and with liquids between meals—the first or second day after operation in uncomplicated cases. Such a diet seldom gives them discomfort after eating, in contrast to liquid foods, which not infrequently give rise to a feeling of sickness, and sometimes produce definite postcibal symptoms—though only mild ones—even during the period in hospital.

When the patient leaves hospital, it is explained to him that after partial gastrectomy a great deal of the food he eats goes direct into the intestine, and that the intestine often does not tolerate food which earlier had no ill effects at all. He is given the usual advice to eat 4—5 meals a day and to rest after meals. He should continue with solid foods, try different things in increasing amounts, and after a time begin with liquids. Milk may be tried after about a month. He should give up any food which does not agree with him, trying it again after some weeks. Any other after-treatment that may be necessary follows the lines described above.

My experience with this after-treatment is limited. I have not observed any undesirable side reactions. My impression is that the proportion of patients free from postcibal symptoms—according to the classification used in this work—is roughly the same as in the follow-up investigation described in earlier chapters. However, patients who have postcibal symptoms are more mildly affected than those of the follow-up investigation. They soon find out how they should eat in order to feel as well as possible.

Summarising:—The treatment of postcibal symptoms is often both difficult and time-consuming. But dietetic and medical measures usually lead to an improvement, and sometimes to complete relief. Surgical correction seldom seems necessary. It appears to be possible to achieve a considerable diminution in the severity of postcibal symptoms by prophylactic measures in the postoperative period, mainly by a diet different from that in general current use.

CHAPTER 15

General Discussion and Conclusions

The principal questions the present investigation was designed to answer (cf. p. 21) have been discussed in earlier chapters, in connection with the accounts of results obtained.

Briefly, postcibal symptoms of a more or less definite character—as they have been defined in this work—were found to affect about 65 % of persons partially gastrectomised for peptic ulcer. The symptoms were usually mild, but were more pronounced in about 12 % of all cases. Persons not gastrectomised also had postcibal symptoms, though the incidence was much lower—about 10 %—and the symptoms very seldom at all severe.

There is a statistically significant correlation between postcibal symptoms and allergy, for both gastrectomised and non-gastrectomised persons. However, it cannot definitely be inferred from the data of the present investigation that an allergic mechanism is directly involved in the production of postcibal symptoms, although it is probable that in certain cases and on certain occasions the symptoms are due to gastrointestinal allergy. In this connection, histamine should be considered as a possible agent in the production of postcibal symptoms. It is generally accepted that a substance resembling histamine is liberated in allergic reactions—and in all probability by traumata of various kinds as well. In fact, some of the postcibal symptoms are very similar to a histamine reaction (flushing, headache, palpitations, drowsiness, fall in blood-pressure). Release and absorption of histamine or a histamine-like substance would explain such postcibal symptoms as are evidently allergic. By analogy with what Åkerblom (1934) was able to establish for founder in horses, it is also possible that a histidine-decarboxylising bacterial flora in the intestine might liberate histamine from food containing easily decomposable proteins, and that this is then absorbed.

It has also been shown that various factors other than allergy exert a more or less considerable influence on the incidence of postcibal symptoms, their degree of severity, etc.

It was not possible to detect any important difference between groups of patients gastrectomised by the principal methods in current surgical use. However, it does seem that, with B II operations, antecolic anastomosis is to be preferred as far as postcibal symptoms are concerned.

The results are for gastrectomies where one half to three quarters of the stomach was removed. No comparisons regarding the size of the resection have been made, since this is seldom given exactly in the case records. Pulvertaft (1952) found a slight tendency towards an increase in postcibal symptoms as the size of the resection increases. Goligher and Riley (1952), on the other hand, found no difference for different sizes of the resection. In all the gastrectomies mentioned in the above publications, at least half the stomach was removed.

The radiological part of the investigation showed that gastric distension and afferent loop reflux cannot be important causative factors for postcibal symptoms, a conclusion in agreement with those of other authors (cf. Chapter 2). The same applies to afferent loop stasis, since patients with enteroanastomosis had postcibal symptoms as often as those without.

The most generally accepted view is that postcibal symptoms originate in the small intestine. Several circumstances combine to support this opinion. After partial gastrectomy, the small intestine has to cope with food not properly predigested. On an average, a barium-food meal leaves the gastric remnant somewhat more rapidly in patients with postcibal symptoms than in those without (cf. Chapter 9). If patients eat lying down, they either experience no postcibal symptoms or only slight ones. The evacuation of the gastric remnant is then slow (cf. Bruusgaard (1946), Boller (1947)).

The finding that liquid foods and drinking with meals often provoke symptoms accords with observations made by Hoffman (1939), Rieder (1939), Sandström and Hallberg (1946), and Boller (1947), that contrast meals of thicker consistency, or the contrast medium mixed with food, remained longer in the gastric remnant than liquid contrast meals. Sandström and Hallberg also showed that if a patient drinks water after a meal, the evacuation of the meal from the gastric remnant is quicker—an observation which was confirmed in the present investigation during examinations where water was drunk after ingestion of the barium meal. Furthermore, it is well known (Rosenak and Hollander (1944), Alvarez (1949), Case *et al.* (1949)) that if persons with feeding jejunal fistulas are given food slowly, at body-temperature, and fairly isotonic, they experience no distress, whereas solutions introduced rapidly into the intestine, ice-water, hypertonic solutions, and some foodstuffs—e.g. milk—provoke symptoms similar to postcibal ones.

It therefore seems justifiable to assume that postcibal symptoms originate primarily in the small intestine. The sensitivity of the intestine also seems to be of importance in various respects, among other things because the intestine may be rapidly filled even in patients who do not have postcibal symptoms.

A commonly accepted opinion is that distension of the small intestine gives rise to the symptoms. Such distension was seldom discernible concurrently with postcibal symptoms during the radiological examinations (cf. Chapter 9). Others have also pointed this out—e.g. Glaze-

brook and Welbourn (1952), who found that, on the contrary, increased motor activity was common when postcibal symptoms occurred. My investigation shows that signs of increased motor activity were somewhat more common in patients with postcibal symptoms than in those without, which suggests that increased motor activity of the small intestine may be associated with postcibal symptoms to some extent.

As earlier pointed out (p. 14), local distension of the small intestine gives rise to symptoms resembling postcibal ones, but accompanied by pain of a kind unusual with ordinary postcibal symptoms. However, when a slight pressure was applied in a separate section of the intestine of a patient with intestinal fistulas, she experienced a feeling of distension and fullness, and difficulty in breathing, without having any pain (cf. p. 97). It therefore seems possible that under certain conditions local distension of the small intestine may be of importance in the production of postcibal symptoms. This mechanism is probably uncommon as a cause of definite postcibal symptoms, but is more likely to be involved when the symptoms are accompanied by appreciable pain.

Highly irritating substances — even in small quantities — such as hypertonic glucose or salt solutions (cf. pp. 15, 97), coming into contact with the mucous membrane of the small intestine, may give rise to symptoms very similar to postcibal ones. Partially gastrectomized persons often did not tolerate particular foods — occasionally even in small quantities. Such intolerance is more common the more severe the patient's postcibal symptoms. It seems unlikely that the symptoms in these cases are due to distension of the small intestine. The mechanism involved is most probably of another kind. It is not possible to decide whether it is a question of neurogenous or humoral factors, or whether the symptoms may sometimes arise from particular substances absorbed through the mucosa, especially if this is injured in some way.

The fact that procaine has a beneficial effect in many cases, which may be ascribed to a light anaesthetisation of the mucous membrane, suggests that the sensitivity of the intestinal mucosa is an important factor. However, procaine, like many other drugs that have been used in the treatment of postcibal symptoms, is so multiple in its effects that no safe conclusions about the causes of the symptoms can be drawn from pharmacological observations.

The above considerations make me agree with Alvarez (1949), that it seems most likely that postcibal symptoms are usually due to mechanical, physical or chemical stimulation of the jejunal mucosa. Furthermore, I think that it is usually differences in the degree of sensitivity of the small intestine that determine whether postcibal symptoms arise or not. That is to say, *the postcibal symptoms may in general be regarded as due to the response of the small intestine, especially its mucosa, to a sufficiently strong non-specific irritation.*

If it is true that the degree of sensitivity of the small intestine is of primary importance for the aetiology of the postcibal symptoms, we have an acceptable explanation of the fact that postcibal symptoms are more common among allergics, as well as of the fact that they also occur—or may be provoked—in persons not gastrectomised. Moreover, it is then quite natural that *the more rapidly the gastric remnant empties the food, the more food the intestine has to accommodate, and the greater the area in contact with the food, the greater is the possibility that postcibal symptoms will arise.* Factors influencing these circumstances will consequently also exert an influence on the occurrence and severity of postcibal symptoms. The good effect of dietetic treatment along the lines given in Chapter 14 may also be explained most easily in this way. For instance, the exclusion of particular foodstuffs may remove one source of irritation of the intestinal mucosa; and food of thicker consistency leaves the gastric remnant more slowly (cf. p. 112).

Some results of the present investigation have a bearing on the *indications for partial gastrectomy in cases with peptic ulcer.* It is not yet possible to say with certainty which patients will suffer from postcibal symptoms after partial gastrectomy. However, as regards women with allergic diseases, it is practically certain that they will get postcibal symptoms, in most cases of severe or moderate character. It is therefore advisable to observe particular caution in deciding to operate in such cases. Otherwise, I do not think that the possibility of postcibal symptoms after the operation need alter the commonly accepted indications for partial gastrectomy for peptic ulcer. The high incidence of postcibal symptoms makes it, however, particularly desirable that dietetic measures which experience has shown to mitigate the symptoms should be applied wherever possible. The patient should be put on a diet in the period immediately after operation, and should later be advised how to regulate his eating habits, so as to avoid postcibal symptoms as far as possible.

Summary

1. Postcibal symptoms—early symptoms after meals—have been studied by means of a follow-up investigation, together with various tests on particular groups of patients.

2. 624 patients partially gastrectomised for peptic ulcer were followed up ½—15 years after operation. They comprised all the surviving patients from those who had been operated on during certain periods. 614 were interviewed personally, and 10 contacted by letter. In addition, 379 persons who had not undergone gastrectomy were interviewed personally, or answered detailed questionnaires.

3. All symptoms commencing within about half an hour after meals have been regarded as postcibal. They were divided into different grades. *Grade pc 0:* practically no symptoms. *Grade (pc):* occasional, slight, or "latent" symptoms. *Grade pc:* definite symptoms, with weakness, nausea, abdominal symptoms, palpitations, feeling of warmth, sweating, dizziness, headache, and/or other symptoms. This grade was divided into three groups, according to the frequency and severity of the distress. *Grade pc 1:* mild symptoms—the patient usually did not need to rest after meals. *Grade pc 2:* moderate symptoms—the patient had to lie down once a week or more after meals. *Grade pc 3:* severe symptoms—the patient experienced symptoms after practically every meal, and had to rest at least once a day after eating.

4. The incidence of postcibal symptoms in the total series of partially gastrectomised patients was: pc 0, 32.7 % ; (pc), 26.0 % ; pc 1, 29.2 % ; pc 2, 9.4 % ; pc 3, 2.7 %. Women had symptoms more often than men —the difference being statistically significant. The incidence among old people was somewhat lower. No difference was found between patients operated on for gastric and duodenal ulcers. Various types of gastrectomies in common use did not show any important differences in this respect—although postcibal symptoms were more often absent after B II ops. with antecolic anastomosis, and possibly B I ops., than after B II ops. with retrocolic anastomosis. Addition of an enteroanastomosis or a valve in the stoma in B II ops. with retrocolic anastomosis had no effect.

5. Postcibal symptoms in partially gastrectomised patients usually developed some weeks or 1—2 months after the operation, but in some cases several years later. In about 40 % of the cases with definite

symptoms, these remained unchanged for years. In other cases there was a more or less obvious improvement in the course of time.

6. Among non-gastrectomised persons, more than 10 % had some kind of postcibal symptoms and 4 % definite postcibal symptoms. Patients with peptic ulcer did not seem to have definite postcibal symptoms more often than others.

7. The symptomatology of postcibal symptoms, and factors influencing them, are dealt with. In some cases there were obviously allergic postcibal symptoms (urticaria, vasomotor rhinitis). The more severe the symptoms, the more often were the patients unable to eat meals of ordinary size. Fluid food and liquids with meals were especially apt to provoke symptoms. 47 % of all gastrectomised patients did not tolerate milk and milk foods. About 20 % did not tolerate sweets, and a large variety of other foods—quite often in small quantities—also provoked postcibal symptoms in some cases.

8. The incidence of postcibal symptoms was higher among patients with preoperative allergy than among those without—the difference being statistically significant. Women with allergic diseases were especially liable to have moderate or severe postcibal symptoms. Non-gastrectomised persons with allergy (asthma) also had postcibal symptoms in a higher proportion of cases than non-allergic persons.

9. In radiological examinations with liquid barium meals, the differences between patients with postcibal symptoms and those without were relatively small as regards the emptying of the gastric remnant and the spread of the contrast medium in the small intestine. In other respects there seemed to be no difference.

10. Tests on a non-gastrectomised patient with ileal fistulas confirmed the earlier conclusion that the postcibal-like symptoms provoked by distending the intestine are accompanied by appreciable pain. Similar symptoms—without the pain—could also be provoked by instilling small amounts of concentrated glucose solution into the small intestine.

11. Gastrectomised patients were often underweight, those with postcibal symptoms much more often than those without. Weights increased with time, but about 20 % of partially gastrectomised men continued to weigh at least 5 kg less than their average preoperative weight.

12 The majority of patients paid but slight attention to their postcibal symptoms. The chief reasons for this were: that the symptoms were of short duration, that patients attributed distress to their own carelessness in eating, and that there was seldom any pain. However, where the symptoms were moderate or severe, they constituted a definite problem, and might have a considerable influence on the patient's everyday life and work.

13. Hypoglycaemic symptoms were found in 13 % of the gastrec-

tomised patients, but were seldom of importance. The symptoms were more common with B I ops. than with B II.

14. Treatment—dietetic, medical, and surgical—is discussed. Good results were obtained with small doses of procaine hydrochloride perorally. Dietetic treatment—the avoidance of liquids with meals, exclusion of milk and other particular foodstuffs—is important, nearly always producing an improvement or even a cure of definite postcibal symptoms. By prophylactic measures in the postoperative period it seems possible to diminish the severity of postcibal symptoms. A diet with dry and solid food, without milk, and with liquids between meals, should be provided immediately after operation. On leaving hospital the patient should be advised to find out by trial and error what he tolerates best.

15. Causes previously put forward to account for postcibal symptoms are discussed. It is concluded that the symptoms usually emanate from the small intestine, and that the degree of sensitivity of the small intestine decides whether postcibal symptoms occur or not. Sometimes there appears to be an allergic sensitivity. In general, postcibal symptoms may be regarded as the response of the small intestine—especially its mucosa—to a sufficiently strong non-specific irritation.

16. Finally, the indications for partial gastrectomy for peptic ulcer are briefly discussed as regards postcibal symptoms. It does not seem necessary to alter the commonly accepted indications for operation, except for women with allergic diseases, where special caution is advisable. It is once more stressed that a dietetic regimen along the lines mentioned above is highly desirable after the operation.

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Abbreviations after Quarterly Cumulative Index Medicus.

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